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TAXMANN®'S

Fundamentals of Financial Management

Dr. R.P. Rustagi

With Excel Applications

14th Edition

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who bestowed on me
the inspiration and strength
to take up this work.

[CBCS] Choice Based Credit System

TAXMANN®'S

Fundamentals of Financial Management

Dr. R.P. Rustagi
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14th Edition

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14th Edition : July 2019

Published by :
Taxmann Publications (P.) Ltd.

Sales & Marketing :
59/32, New Rohtak Road, New Delhi-110 005 India
Phone : +91-11-45562222
Website : www.taxmann.com
E-mail : sales@taxmann.com

Regd. Office :
21/35, West Punjabi Bagh, New Delhi-110 026 India

developed by :
Tan Prints (India) Pvt. Ltd.
44 Km. Mile Stone, National Highway, Rohtak Road
Village Rohad, Distt. Jhajjar (Haryana) India
E-mail : sales@tanprints.com

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Other books by same Author and the Publisher :

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8. ***Fundamentals of Management Accounting***
   (For B.Com.(H.) Vth Semester/Annual Mode of University of Delhi and other courses in Commerce)

Preface

Financial Management has emerged as an interesting and exciting area for the academic studies as well as for practitioners. The financial management deals with the financial decision making. All decisions taken by a finance manager have financial implications. Financial Management evaluates the financial implications and help taking these decisions in such a way as to maximize the value of the firm or in other words to maximize the wealth of the shareholders. The present book has been designed to discuss the fundamental concepts and principles of financial management. It aims to fulfil the requirements of the students of undergraduate courses in commerce and management, particularly the B.Com. (H) Vth Semester/Annual Mode of Delhi University and other central universities throughout India.

The book deals primarily with the theory and concepts of financial management. Keeping in view the target student group, an attempt has been made to present the subject-matter in a non-mathematical and non-technical way. The motivation for the book was provided by the interaction with the students in the classroom and it has been shaped by the experience of teaching the subject-matter at different levels. The reactions and responses of the students have been incorporated at different places. It has been observed that students want a simple, systematic and comprehensive explanation of the concepts and theories underlying the financial management. The subject-matter, throughout the book, has been presented in a well knit manner.

As a student of financial management and now as a teacher, I have gone through a vast amount of literature available on the subject. I feel indebted to several authors, researchers and my teachers who have helped me a lot in understanding various issues in finance. I am also grateful to my students who have provided the stimulus for writing this book. The real inspiration for writing this book came from my friend and erstwhile colleague, Shri S.K. Gupta, M.Com., M.Phil., M.FIS, CPA of Cleveland State University, U.S.A. Initially, he was to co-author the book, but he could not because of his other pre-occupations.

The motive for Fourteenth edition has been provided by the overwhelming response of the students and academicians towards the earlier editions.

Efforts have been made to retain the basic structure of the book. Nevertheless, numerous notes and explanations have been added at appropriate places. New practical questions have been added to Graded Illustrations in various chapters. Other highlights of this edition are:

- *Multiple Choice Questions (MCQ), Graded Illustrations and Theoretical Questions have been added at the end of different chapters.*
- *Questions appeared in Latest Question Papers of Delhi University have been incorporated at appropriate places.*
- *In Chapter 4, basic principles of calculations of Cash Flows for capital budgeting proposals have been summarized as a quick reference for the readers.*

- *In Chapter 4, a new section has been introduced to deal with the Analysis of Risk in Capital Budgeting proposals.*
- *In Chapter 4, discussion on Modified Internal Rate of Return has been inserted.*
- *Working Notes and Explanations have been added at various places and in Graded Illustrations to explain calculations and assumptions.*

I am indebted to Sh. H.N. Tiwari, Asstt. Professor, Shri Ram College of Commerce for immensly helping in preparation of Appendix I, "Financial Decision making with EXCEL". I am thankful for the comments and suggestions made by the colleagues from Delhi University and other professional institutes for the improvement of the book. Further comments and suggestions for improving the quality of the book are welcome and will be gratefully acknowledged. Taxmann Publications (P.) Ltd., deserves a special mention for timely release of the book in its new format.

DR. R.P. RUSTAGI

Organization of the Book

The subject-matter has been presented in 17 Chapters placed in Six Parts each dealing with a specific area of financial management. Part I, deals with the introduction to financial management, finance function and the financial decision making. The basic concepts of Risk-Return trade off and the Time Value of Money have also been explained in detail in Part I, comprising of Chapters 1 and 2.

Part II of the book deals with long-term investment decisions *i.e.* the capital budgeting process. Chapter 3 explains the significance and process of capital budgeting. The different techniques of evaluation of capital budgeting proposals have been discussed in Chapter 4.

The Financing Decision deals with the leverage and the formation of the capital structure of any firm and it has been discussed in detail in Part III. The cost of capital, an important concept for capital budgeting and financing decisions, has been taken up in Chapter 5. Chapters 6 and 7 deal with the Leverage Analysis and EBIT-EPS Analysis, Different theories on the relationship between the leverage, cost of capital and value of the firm have been taken up in Chapter 8. The theoretical considerations for the planning of the capital structure have been summarised in Chapter 9 of the book.

Part IV (Chapters 10 & 11) deals with another important area of decision making *i.e.* the Dividend Decision. Besides giving an analytical overview of different models on the relationship between dividend decision and value of the firm, an attempt has also been made to give the determinants of dividend policy for any firm.

Part V deals with the management of current assets (total as well as individual). Chapter 12 deals with the planning and management of total working capital and discusses the basic trade off between liquidity and profitability. The estimation of total working capital requirement has been taken up in Chapter 13. The management of individual elements of working capital *i.e.* the Cash, Receivables and Inventory has been taken up in Chapters 14, 15 and 16 respectively of the book.

In the last, Valuation of Securities has been discussed in Chapter 17 in Part VI of the book. Each of the 17 Chapters has been structured in the following fashion:

1. Synopsis (Chapter Plan)
2. Main Body (Contents)
3. Points to Remember
4. Graded Illustrations
5. Objective Type Questions (True/False)
6. Multiple Choice Questions
7. Theoretical Assignments
8. Problems (Unsolved Questions with Answers).

Detailed Outline of Financial Management Syllabus

CBCS B.COM. (HONS.) SEMESTER V/ANNUAL MODE (UNIVERSITY OF DELHI)

1. **Introduction -** Meaning, Functions of Financial Management, Objectives of Financial Management, Critical analysis of Profit Maximization, Wealth Maximization, EPS, etc., Time Value of Money, PV concepts and calculation, Concept of Risk and Return.
2. **Capital Budgeting -** Concept, Significance, Characteristics of Capital Investment, Types of Capital Investments, Capital Budgeting Process, Estimation of Costs and Benefits, Cash Flows *vs.* Profit, Initial Investment, Additional Working Capital, Terminal Cash Flows, Depreciation, Dividends and Interest, Treatment of Taxes. **Methods :** Payback Period, Accounting Rate of Return, Net Present Value, Internal Rate of Return, Profitability Index, 'MIRR', Definition, Assumptions, Calculation, Acceptance/Rejection Rule, Advantages and Disadvantages, Risk & Uncertainty in Capital Budgeting - Certainty - Equivalent Method and Risk Adjusted Discount Rate.
3. **Cost of Capital -** Concept, Significance of Cost of Capital, Overall *vs.* Specific Cost of Capital (Simple Cases), Debt (excluding amortization of the cost of issue, semi annual interest payments), Preference Shares (Both Redeemable and Non-Redeemable), Equity (Dividends as well as Earnings Approach), Retained Earnings, Calculation of Weighted Average Cost of Capital, Meaning, Significance, Calculation, Determination of Proportions or Weights, Choice of Weights, Book Value *vs.* Market Value Weights, Concept of Marginal Cost of Capital.

   Financing Decision - Definition of Capital Structure, Meaning of Operating and Financial Leverages, Measures of Financial Leverage, Effect on the shareholders' risk, Financial risk; Capital Structure Matters : The Net Income Approach; Capital Structure does not Matter : The Net Operating Income Approach; MM Hypothesis without taxes: Assumptions, Theory, Criticism, Arbitrage process, Factors Influencing Capital Structure.
4. **Dividend Policy -** Meaning, Significance, Dividend Policy and Valuation of the Firm, Irrelevance of Dividends, Passive Residuals Theory, MM Hypothesis, Assumption, Theory, Model; Relevance of Dividends : Walter's Models, Determinants of Dividends, Forms of Dividend Payments *i.e.,* cash, bonus shares, Stability of Dividends.
5. **Working Capital Management -** An overview of working capital management, Definition of working capital, Types of working capital, Trade off between profitability and risk, Computation of Working Capital, Determinants of Working capital, Sources of funds for working capital.
   - **Cash Management -** Meaning, Significance, Motives for holding cash, Factors determining cash needs, Preparation of cash budget, Receipts and Payments method.

- **Receivables Management -** Meaning, Objectives, Costs and benefits associated with the receivables, Credit Policies, Credit Standards (*i.e.*, effect of collection costs, bad debts, sales volume, average collection period), Credit analysis (e.g., obtaining credit information analysis of credit information), Credit Terms (*i.e.*, cash discount, credit period), Collection Policies.
- **Inventory Management -** Meaning, Significance, Costs of holding inventory (*e.g.*, ordering costs, carrying costs), Benefits of holding inventory, Economic Order Quantity.

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Abbreviations and Notations

b	Retention Ratio (1-DP ratio)
B_o	Bond Value at present
β	Beta factor (CAPM)
BV	Book Value (Also Balance Sheet Value)
C_0	Cost at Present [Initial cost]
CA	Current Assets
CAPM	Capital Assets Pricing Model
CE	Certainty Equivalent
CF	Cash Flows
CFS	Cash Flow Statement
CL	Current Liabilities
CML	Capital Market Line
CVAF	Cumulative Value Annuity Factor
CVF	Cumulative Value Factor
CV	Coefficient of Variation
D	Debt
Div	Dividend on Equity Shares
DCL	Degree of Combined Leverage
Dep.	Depreciation
DFL	Degree of Financial Leverage
DOL	Degree of Operating Leverage
DP Ratio	Dividend Pay out Ratio
DPS	Dividend Per Share
E	Equity or Value of Equity
EAM	Equivalent Annuity Method
EBIT	Earnings before Interest & Taxes (also NOP)
EBT	Earnings before Taxes (also PAT)
EOQ	Economic Order Quantity
EPS	Earnings Per Share
FA	Fixed Assets
FC	Fixed Cost
FL	Financial Leverage (also DFL)
FV	Future Value
g	Growth Rate
GP	Gross Profit
I or Int.	Interest
I_{RF}	Risk-free Rate of Interest
IRR	Internal Rate of Interest
k	Rate of discount/Required rate of return
k_d	Cost of Debt
k_e	Cost of Equity Capital
k_o	Overall Cost of Capital (also WACC)
k_p	Cost of Preference Share Capital
k_r	Cost of Retained Earnings
MP	Market Price
n, N	Number of Years
NOP	Net Operating Profit (also EBIT)
NP	Net Profit (also PAT)
NPV	Net Present Value
NW	Net Worth
OC	Operating Cycle
OL	Operating Leverage (also DOL)
P_0	Current Market Price of Share
P_1	Market Price after 1 year
P_n	Market Price after n years
PAT	Profit After Tax (also NP)
PB	Payback Period
PBIT	Profit before Interest & Taxes (also EB1T)
PBT	Profit before Tax (also EBT)
PD	Preference Dividend
PE	Ratio Price Earnings Ratio
PI	Profitability Index
PV	Present Value
PVAF	Present Value Annuity Factor
PVF	Present Value Factor
r	Required Rate of Return

R_M	Rate of Return on Market Portfolio
R_S	Required Rate of Return of a Security
ROA	Raturn on Assets
ROI	Return on Investment
ROR	Rate of Return
RV	Redemption Value
SEBI	Securities and Exchange Board of India
SF	Shareholders Funds
SLM	Straight Line Method (of Depreciation)
t	Tax Rate
V	Value of the Firm
V_L	Value of Levered Firm
V_u	Value of Unlevered Firm
VC	Variable Cost
w,W	Weight
WACC	Weighted Average Cost of Capital, k_0
WC	Working Capital
WDV	Written Down Value
WIP	Work in Process (or Progress)
WMCC	Weighted Marginal Cost of Capital.
YTM	Yield Till Maturity

PART I

BACKGROUND

Financial Management is concerned with creation and maintenance of wealth in a rational way. In its endeavour, it focuses on the decision making. Almost all decisions taken by an individual or a firm have financial aspects and implications. Financial management is the study of decisions that have financial implications. In order to make optimal decisions, the firm must have a goal for evaluating the efficiency of such decision process. In financial management, this goal is defined as the maximization of Wealth of Shareholders. The basic foundation of the theory of financial management may be found in two concepts *i.e., the time value of money and the risk-return trade-off.* Money received today is worth more than received after a year from now. In financial management, benefits and cost occurring at different point of time are made comparable by applying the concept of time value of money. In the decision making process, the other concept, commonly applied, is that the return of an option must be commensurate with the risk involved. The basic notion is that no investor is ready to take additional risk unless he is compensated with additional return. With reference to business firms, every financial manager undertakes the financial decision making process to answer three basic questions namely :

1. How should the scarce resources be allocated? (Investment Decisions)
2. How should these investments be financed? (Financing Decisions)
3. How much profits generated by these investments be distributed and how much be reinvested? (Dividend Decisions)

While taking these decisions, the financial manager has to consider: That every decision has a risk as well as return dimension; that there is a time value of money, and that cash is a better measure of evaluating financial decisions. Part I attempts to provide an introduction to Financial Management and Time Value of Money. The learning objectives are:

- *What is Finance and Financial Decision Making?*
- *What is the objective of Financial Management?*
- *What is the Risk-Return dimension of Financial Decisions?*
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CHAPTER

1

Financial Management - An Introduction

"A prerequisite to the understanding of financial theories, concepts, tools and techniques is to answer two basic questions : What is finance? What are the functions and goals of finance manager? Answering these questions will set the stage for an understanding of the important decision areas for the financial manager and the methods he or she uses to resolve problems."[1]

SYNOPSIS

- Evolution of Finance as a Discipline.
- The Scope of Finance Function.
  - The Investment Decisions.
  - The Financing Decisions.
  - The Dividend Decisions.
- The Financial Decision Making.
  - Identification of the Relevant Groups.
  - Identification of the Objectives.
    - Profit Maximization *Versus* Wealth Maximization.
- Risk-Return Dimension of Financial Decision Making.
- Financial Management and Other Areas of Management.
- Basic Propositions and Axioms of Financial Management.
- Treasury Management.
- Financial Management and Financial Accounting.
- Financial System and Environment in India.

1. Gitman L.J., *Principles of Managerial Finance,* Harper and Row Publishers, New York, 1985, p. 3.

Financial management can be defined as the management of flow of funds and it deals with the financial decision making. It encompasses the procurement of the funds in the most economic and prudent manner and employment of these funds in the most optimum way to maximize the return for the owner. Since raising of funds and their best utilization is the key to the success of any business organization, the financial management as a functional area has got a place of prime relevance in every firm. All business decisions have financial implications, and therefore, financial management is inevitably related to almost every aspect of business operations. Broadly speaking, the financial management includes any decision made by a business/investor that affects its finances. The present work makes an attempt to discuss the financial concepts, tools, techniques, procedures, steps and the evaluations required to optimize the business decisions.

EVOLUTION OF FINANCE AS A DISCIPLINE

To begin the study of financial management, what is needed is to address to two central issues. First, what is financial management and what is the role of finance manager? Second, what is financial decision making and what is the goal of financial management?

Finance has emerged as a distinct area of study during second half of the twentieth century. But even before that some direct or indirect references to finance function were made on a casual basis. The evolution of finance function and the changes in its scope appeared due to two factors namely (1) the continuous growth and diversity in business, and (2) the gradual appearance of new financial analytical tools. Broadly speaking there are three overlapping phases of evolution of finance function.

Finance upto 1950 - The Traditional Phase

Initially, finance was a part of economics and no separate attention was paid to finance. Business owners were more concerned with operational activities. The finance manager used to be concerned with record keeping, preparing different report, and managing cash. A finance manager was called upon in particular only when his speciality was required to locate new sources of funds whenever there was a need felt for the funds. The traditional phase can be summarized as follows :

(*i*) Finance function was concerned with procuring of funds to finance the expansion or diversification activities and thus the occurrence of finance function was episodic in nature. Finance function was not a part of regular managerial operations.

(*ii*) In order to finance business growth, there was an emergence of institutional financing and institutional banking giving rise to finance industry.

(*iii*) Finance function was viewed particularly from the point of view of supplier of funds *i.e.*, the lenders, both individuals and institutions. The emphasis was to consider the interest of the outsiders. The internal decision making process and the persons involved in the process were of lesser importance.

(*iv*) The focus of attention was on the long term resources and only the long term finance was of any concern. The concept of working capital and its management was virtually non-existent.

(*v*) The treatment of different aspects of finance was more of a descriptive nature rather than analytical. In fact, there were no analytical financial decision making as such.

(*vi*) Finance was concerned with procuring of fund primarily by issue of securities such as equity shares, preference shares and debt instruments. So, a knowledge of the sources of funds, what securities to sell, to whom and by what techniques to sell, was needed.

Gradually, the scope of finance function widened and day-to-day problems of finance were also incorporated. Funds analysis and control on a regular basis, rather than on a casual basis started. There was, in fact, an extension of the traditional phase and around early fifties when the scope of finance function started expanding in big way.

After 1950 - An integrated view of Finance Function

As a result of the gradual increase in competition and growth in business at an accelerated rate, together with regular occurrence of boom and recession in economic activities, the finance function has become increasingly analytical and decision oriented. The scope of finance function has widened further and includes not only the measures of procuring funds at episodic events but also the optimum utilization through data based analytical decision making. The finance manager has emerged as a professional manager involved with capital funds to be raised by the firm, with the allocation of these funds to different projects and with the measurement of the results of each allocation. Significant contributions to the development of modern theory of financial management are :

(1) **Theory of Portfolio Management** developed by *Harry Markowitz* in 1952, which deals with portfolio selection with risky investments. This theory uses statistical concepts to quantify the risk-return characteristics of holding a group/portfolio of securities, investments or assets. A significant contribution of this theory is that the risk of one investor is viewed in its totality rather than evaluating the risk of one security only. This theory at a later stage lead to the development of Capital Asset Pricing Model which deals with pricing of risky assets and the relationship between risk and return.

(2) **The Theory of Leverage and Valuation of Firm** developed by Modigliani and Miller in 1958. They have shown by introducing analytical approach as to how the financial decision making in any firm be oriented towards maximization of the value of the firm and the maximization of the shareholders wealth.

These developments are in fact the start of the development of an integrated theory of financial management which now includes theory of efficient capital markets, dividend policy,

risk and uncertainty dimensions to the financial decision making, valuation models, working capital management, *etc.*

The modern phase of the evolution of finance function can be summarized as follows :

(*i*) The scope has widened to include the optimum utilization of funds through analytical decision making.

(*ii*) The finance function is now viewed from the point of view of the insiders *i.e.* those who are taking decisions in the firm.

(*iii*) The knowledge of the securities, financial markets and institutions is also necessary and the scope of finance manager's function has expanded beyond being nearly descriptive into analytical in nature.

The subject matter of finance function is still developing and many new theories as well as refinement to existing theories may be in the offing.

FINANCE AS AN AREA OF STUDY

Finance as an area of study is concerned with two distinct areas namely the financing and the investing. Financing deals with the management of sources of capital. The financing area concentrate on the type, size and composition of capital resources. Investing, on the other hand deals with management of uses of capital. The investing area, therefore, concentrate on the type, size and composition of investment of capital. Both these areas of study are considered as part of financial studies.

Types of financial actions :- Financial actions in different types of firms may be divided into different groups such as :

(*i*) **The Financial Management of Trading or Manufacturing Firms** : In case of trading or manufacturing firms, the central question is how to acquire funds and how to invest these funds. In this case, the finance manager acquires the funds from financial market by offering different types of securities and invest these funds in purchasing real and tangible assets. For example, a firm issues shares and invest the proceeds in purchasing fixed assets such as plant *etc.* This may be known as Core Financial Management.

(*ii*) **Financial Management of Financial Institutions :** The financial institutions raise funds in financial markets and also invest these funds in financial markets. For example, financial institutions raise funds from individuals investors in one financial market and invest these funds in other financial markets.

(*iii*) **Financial Activities Relating to Investment Management:** This area of finance deals with finding out the best collection or portfolio of financial assets and thus focuses attention on allocation of funds once they are acquired. This area focuses attention whether an investor should put all his money in one financial asset or in a combination of different financial assets. This may be called Investment/Portfolio Management.

These three areas are complementary in the sense that study of one area involves study of the other areas also. A financial manager of a firm has to deal with financial institutions as well as investors while issuing securities in the capital market. In the present work, primary focus is on financial management of trading firms but other areas have also been touched wherever necessary.

(*iv*) **International Finance** : This area focuses attention on flow of funds beyond national boundaries. Balance of Payment, Foreign Exchange Risk Management, *etc.*, are some special points and considerations of this area.

(*v*) **Public Finance** : This area of financial management covers the funds management of a Government (National, State or a local authority). Tax Management, other cess, *etc.* are considered and studied here. Funds are received from different sources and are used as per given policies of the Government.

SCOPE OF FINANCE FUNCTION

Initially, the finance manager was concerned and called upon at the advent of an event requiring funds. The finance manager was formally given a target amount of funds to be raised and was given the responsibility of procuring these funds. His function was limited to raising funds as and when the need was felt. Once the funds were procured, his function was over. However, over a period of time, the scope of his function has tremendously widened. His presence is required at every moment whenever any decision having involvement of funds is to be taken. Now-a-days, the financial manager is required to look into the financial implications of any decision in the firm. The function of finance manager now is to manage the funds. In particular, the finance manager has to focus his attention on :

(*i*) Procuring the required quantum of funds as and when necessary, at the lowest cost.

(*ii*) Investing these funds in various assets in the most profitable way, and

(*iii*) Distributing returns to the shareholders in order to satisfy their expectations from the firm.

These three functions of the finance manager encompasses most of the financial events in any firm. Thus, the functions of finance manager may be summarized to include the following :

(*i*) Overall financial planning and control,

(*ii*) Raising funds from different sources,

(*iii*) Selection of fixed assets,

(*iv*) Management of working capital, and

(*v*) Any other individual financial event.

While performing these functions, finance manager has to operate as intermediary between the firm's operations one hand and the capital market on the other. The role of finance manager as an intermediary arises because of two-way cash flows between the firm and the investors. In the first instance, the investors provide funds through capital market, to the firm, and second, the firm distributes profits among the investors in the form of interest or dividends. The firm raises

funds by selling ownership securities or debt securities or borrowings in the capital market. The funds raised in this way become the pool of the investible funds which are committed to the investment decisions of the firm. The investment projects generate profit which are either distributed to the suppliers of investible funds or retained in the business for reinvestment in the future projects. The finance manager has to take care of the interest of the investors as well as the firm. His position as an intermediary has been depicted in the Figure 1.1.

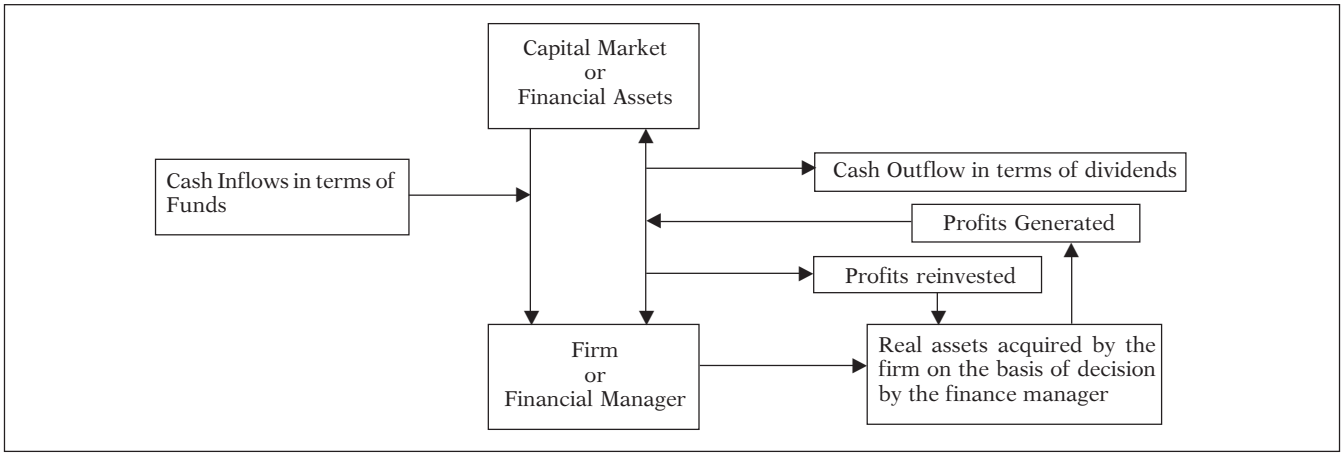

FIG. 1.1: ROLE OF FINANCE MANAGER AND TWO-WAY CASH FLOWS TO CAPITAL MARKET

The finance manager is usually faced with the following distinct scenarios :

(*i*) **What should be the size of firm and how fast should it grow ?** The size of the firm is measured by the value of its total assets as shown in the balance sheet. The firm's growth can be measured by the yearly percentage change in the assets of the firm. The finance manager has to decide about the size as well as the growth pattern of the assets. He should recognize that large assets and growing even larger need not necessarily be good for the firm and, therefore, should take the decisions accordingly.

(*ii*) **What are the various types of assets to be acquired ?** or, What should be the composition of the assets of the firm? Whenever and whichever assets are acquired by the firm, the finance manager has to evaluate as to how is it going to contribute to the wealth of the firm. This is also known as the ***Investment Decision.***

(*iii*) **What should be the pattern of raising funds from various sources?** or, What should be the composition of the liabilities of the firm? The liabilities and capital represent the financing sources which the firm uses to raise funds to make investments. The raising of funds from these sources in varying compositions has different implications. Deciding about the best mix of the liabilities and capital is referred to as the ***Financing Decision.***

Depending upon the nature and size of the firm, the finance manager is required to perform all or some of these functions from time to time. While performing these functions, he is required to take different decisions which can be broadly classified into three groups - Those relating to resource allocation (the investment decision), those covering the financing of these investments (the financing or capital structure decision) and those determining how much cash be taken out and how much reinvested (the dividend decision).

(i) Investment Decisions : Firms have scarce resources that must be allocated among competitive uses. The financial management provides a framework for firms to take these decisions wisely. The investment decisions include not only those that create revenues and profits (*e.g.*, introducing a new product line) but also those that save money (*e.g.*, introducing a more efficient distribution system). So, the investment decisions are the decisions relating to assets composition of the firm. Assets represent investment or uses of the funds that the firm makes in expectation of earning a return for its investors. Broadly, these assets can be classified into fixed assets and current assets, and therefore, the investment decisions can also be bifurcated into *Capital Budgeting decisions* (relating to fixed assets) and the *Working Capital Management* (relating to current assets).

The fixed assets of a firm are the primary factors and the determinants of the profitability of a firm. The earnings of the firm are basically caused by the fixed assets composition and also the total fixed assets *vis-a-vis* total assets of the firm. The **Capital Budgeting** decisions are more crucial for any firm. A finance manager may be asked to decide about (1) which asset should be purchased out of different alternative options, (2) to buy an asset or to get it on lease, (3) to produce a part of the final product or to procure it from some other supplier, (4) to buy or not an other firm as a running concern, (5) proposal of merger of other group firms to avail the synergies of consolidation, *etc.* All these decisions have long-term ramifications and are generally irreversible. The objective of Capital Budgeting decisions is to identify those assets which are worth more than they cost. A finance manager, therefore, has to take utmost care in dealing with these decisions. The Chapters 3 and 4 of this book deal with Capital Budgeting decisions.

Working Capital Management, on the other hand, deals with the management of current assets of the firm. Though the

current assets do not contribute directly to the earnings, yet their existence is necessitated for the proper, efficient and optimum utilization of fixed assets. There are dangers of both the excessive working capital as well as the shortage of working capital. A finance manager has to ensure sufficient and adequate working capital to the firm. The working capital management has been discussed in Chapters 12 to 16 of the book.

(ii) Financing Decisions : Another group of decisions taken by a finance manager is known as Financing Decisions, which deal with the financing pattern of the firm. As firms make decisions concerning where to invest these resources, they have also to decide how they should raise resources. There are two main sources of finance for any firm, the shareholders funds and the borrowed funds. These sources have their own peculiar features and characteristics. The key distinction between these two sources lies in the fixed commitments created by borrowed funds to pay interest and the principal. The borrowed funds are always repayable (except when the debt instrument is convertible into shares) and require payment of a committed cost in the form of interest on a periodic basis. The borrowed funds are relatively cheaper but always entail a risk. This risk is known as the financial risk *i.e.*, the risk of insolvency due to non-payment of interest or non repayment of capital amount.

The shareholders funds is the main source of funds to any firm. This may comprise of the equity share capital, preference share capital and the accumulated profits. There is no committed outflow for equity shares capital neither in the form of a return nor in the form of repayment of capital. However, the preference share capital has a commitment to be paid a minimum dividend (which is of course conditional) and also for repayment of capital when these shares are to be redeemed after some time (as the preference share in India can only the redeemable preference shares).

Starting with the fundamental proposition that the characteristics of the financing should closely match the characteristics of the assets being financed, he has to undertake different types of analysis and has to consider a whole lot of factors. Leverage Analysis, EBIT-EPS analysis, Capital structure models, etc. are some of the tools available to a finance manager for this purpose. The financing decision and the processes employed by a finance manager have been analyzed in Chapters 5 to 9 of the book.

(iii) Dividend Decision : Another major area of decision making by a finance manager is known as the Dividend decisions which deal with the appropriation of after tax profits. These profits are available to be distributed among the shareholders (subject to legal provisions) or can be retained by the firm for reinvestment within the firm. The profits which are not distributed are impliedly retained in the firm. All firms whether small or big, have to decide how much of the profits should be reinvested back in the business and how much should be taken out in form of dividends *i.e.*, return on capital. On one hand, paying out more to the owners may help satisfying their expectations, on the other, doing so has other implications as a business that reinvests less will tend to grow slower. There cannot be any readymade policy for any firm regarding how much profit is to be distributed and how much portion is to be retained. Retention of profit is of course related to :

1. Reinvestment opportunities available to the firm,
2. The opportunity rate of return of the shareholders.

The distribution of profits by any firm is required to satisfy the expectations of the shareholders. The profits can be distributed to shareholders either as current revenue (*i.e.* the dividends) or as capital receipt (*i.e.* bonus share). These have their own tax implications in the hands of the shareholders as well as the firm. Both have their effect on the market value of the firm also. The finance manager is required to take various decisions regarding distribution of profit as dividend or as bonus shares. In his attempt, he has to look into the funds requirements of the firm and the shareholders interest. The trade off on Dividend decision has been analyzed in Chapters 10 and 11 of the book.

Thus, a finance manager is concerned with :

(*i*) the overall financial analysis and planning,

(*ii*) managing the asset structure of the firm, and

(*iii*) managing the financial structure of the firm.

FINANCIAL DECISION MAKING

In the previous section, it has been stated that the finance manager has to take different types of decisions from time to time. Some of these decisions may be taken once a while *e.g.*, a capital structure decision or a capital budgeting decision. However, the decisions regarding the working capital management are taken on a regular basis. The dividend decision is also almost a regular decision in the sense that it is taken whenever the firm wants to distribute interim dividend, final dividend or bonus shares to the shareholders.

In order to make this process of financial decision making, an efficient and effective one, it is necessary :

(1) to identify the groups whose interest is to be considered and

(2) to identify the goals, the achievement of which helps in measuring the impact of these decisions on the relevant group.

Financial Decision Making and the Relevant Groups

The various groups which may have stakes in the financial decision making of a firm and, therefore, required to be considered while taking financial decisions are :

1. The shareholders,
2. The debt investors,
3. The employees,
4. The customer and the suppliers,
5. The public,
6. The Government, and
7. The management.

These groups have different perceptions of the firm and the firm has different relatives importance for these perceptions.

The shareholders are no doubt of primary concern to any firm and their interest is put on the top priority. Traditionally, the public interest gets the last priority, but due to the legislative measures and the work of different non-Government organizations, the public interest has also emerged as the stakeholder in the financial decisions making process of any firm.

In financial management, the techniques and processes of financial decisions making are based on the assumption that it is only the shareholders group whose interest is to be considered and protected. This is not without reasons. The extent of the effect of a particular financial decision on the shareholders interest can be easily, fairly and accurately measured whereas the effect on other groups is difficult to be measured and often depends upon the subjective considerations. But it does not mean that the interests of the other groups are unimportant. In fact, interests of the other groups are protected and taken care of either by the Government or themselves. The Government often passes legislations to protect the interest of the public, the employees, *etc.*

At this stage there is a question as to how the interest of the shareholders can be protected and measured ? What is the goal or objective which if achieved will result in protecting and safe-guarding the interest of the shareholders?

Goal or Objective of the Financial Decision Making

A goal of the firm may be defined as a target against which the firm's operating performance can be measured. Regardless of how they are determined or what they are, the goals serve as a point of reference to a decision maker. The objective specifies what the decision maker is trying to accomplish and, by doing so, provides a frame-work for analyzing different decision rules. In most cases, the objective is stated in terms of maximizing some function or variable (profit, size, value, social welfare, *etc.*) or minimizing some function or variable (risk, cost, *etc.*).

A good objective of financial management should have the following characteristics :

(*i*) It should be clear and unambiguous,

(*ii*) It comes with a clear and timely measure that can be used to evaluate the success or failure of a decision, and

(*iii*) It should be consistent with the long-term existence of the firm.

A clear understanding or the definition of the objective of the financial management is a prerequisite as the objective provides a frame-work for optimum financial decision making. Without a well defined goal, the finance manager may wander without a direction. The overall goal of any firm will not serve the purpose here. Rather, such an operationally useful criterion is required, which helps in choosing the best out of several mutually exclusive opportunities in the given circumstances on the basis of the available data.

Several goals of financial management have been cited *e.g.*, maximization of sales revenue, net profit, return of investment, size of the firm, percentage market share, etc. It is already discussed that the main stakeholder group for the financial management is the shareholders group. Therefore, the problem is to identify one out of these several goals which will give the best reflection of the effect of the decision on the shareholders interest. The following two are often considered as the objectives of the financial management :

1. Maximization of the profits of the firm, and
2. Maximization of the shareholders' wealth.

In the following paragraphs, these objectives have been critically evaluated as operationally feasible objective of the financial management.

Maximization of the Profits of the Firm : For any business firm, the maximization of the profits is often considered as the implied objective, and therefore, it is natural to retain the maximization of profit as the goal of the financial management also. Various types of financial decisions be taken with a view to maximize the profit of the firm. Out of different mutually exclusive options that one should be selected which will result in maximum increase in profit. This profit can be measured in terms of the total accounting profit available to the shareholders.

The profit maximization as the objective of financial management has a built in favour for its choice. The profit is regarded as a yardstick for the economic efficiency of any firm. If all business firms of the society are working towards profit maximization then the economic resources of the society as a whole would have been most efficiently, economically and profitably used. The profit maximization by one firm and if targeted by all, will ensure the maximization of the welfare of the society. The profit maximization as objective of financial management will result in efficient allocation of resources not only from the point of view of the firm but also for the society as such.

However, the profit maximization as the objective of financial management fails to deliver the goods in its operational terms. As already stated that various parties have stake in the firm. Though the stake of the shareholders is of prime relevance, yet the interest of other parties such as lenders, creditors, society, etc., cannot be ignored. The finance manager has to face a tough task of reconciling the interest of all these parties. The profit maximization overlooks the interest of other parties than the shareholders. There are various problems with the profit maximization as the objective of financial management. Some of these are as follows :

1. **It ignores the risk.** The profit maximization does not take into account the amount of risk which the firm undertakes in attempting to increase the profits. With profit maximization as the objective, the management may undertake all profitable investment opportunities regardless of the associated risk, whereas that investment may not be worth the risk, despite its potential profitability.
2. **The profit maximization concentrates on the profitability only and ignores the financing aspect of that decision and the risk associated with that financing.** For example, in order to finance a profitable investment, a firm may even borrow beyond capacity.

3. **It ignores the timings of costs and returns and thereby ignores the time value of money.** All the monetary benefits and costs are considered in the absolute value terms without adjusting for time value.
4. **The profit maximization as an objective is vague and ambiguous.** Does it refer to maximization of short term profit or long term profit; after tax profit or profit before tax; profit from the point of view of total funds employed or from the point of view of shareholders only, *etc.* ?
5. **The profit maximization may widen the gap between the perception of the management and that of the shareholders.** Since the profit maximization is not directly related to any measure of shareholders benefits, this principle seems to be self-centered at the cost of loosing attention from the interest of the shareholders, which should be of utmost importance to any firm.
6. **The profit maximization borrows the concept of profit from the field of accounting and thus tends to concentrate on the immediate effect** of a financial decision as reflected in the increase in the profit of that year or in near future. This will not necessarily be correct because many decisions have their costs and benefits scattered over many years.

So, the profit maximization fails to be an operationally feasible objective of financial management. A goal as already stated should be precise, well defined and must be capable to take cognizance of all possible costs and benefits of all the alternatives being evaluated. One such goal is termed as the maximization of shareholders' wealth.

Maximization of Shareholders' Wealth : In the theory of financial management, it is well accepted that the objective of financial management is the maximization of shareholders' wealth. This objective is generally expressed in term of maximization of the value of a share of a firm. It is necessary to know and determine as to how the maximization of shareholder's wealth is to be measured.

The measure of wealth which is used in financial management is the concept of economic value. The economic value is defined as the present value of the future cash flows generated by a decision, discounted at appropriate rate of discount which reflects the degree of associated risk. This measure of economic value is based on cash flows rather than profit. The economic value concept is objective in its approach and also takes into account the timing of cash flows and the level of risk through the discounting process.

The shareholders' wealth is represented by the present value of all the future cash flows in the form of dividends or other benefits expected from the firm. The market price of share reflects this value. Therefore, the economic value of the shareholders' wealth is the market price of the share which is the present value of all future dividends and benefits expected from the firm. As shareholders' wealth at any time is equal to the market value of all his holdings in shares, an increase in the market price of firm's shares should increase the shareholders' wealth.

Maximization of shareholders' wealth as an objective of financial management implies that the financial decisions will be taken in such a way that the shareholders receive highest combination of dividends and the increase in market price of the share. In other words, the shareholder's proportional ownership of a firm represented by a share should be maximized. All financial decisions therefore, are evaluated in terms of their effect on the firm's future cash flows and hence on the market price of the share. The underlying assumption in this approach is that shares are traded in efficient capital market where the effect of a decision is truly reflected in market price of a share.

The goal of maximization of shareholder's wealth as reflected in the market price of the share makes the interest of the shareholders compatible with that of the management. With this objective in sight, the management will allocate the available economic resources in the best possible way within the given constraints of risk. This goal directly affects the policy decision of a firm about what to invest in and how to finance these investments. Further, the goal of maximization of shareholder's wealth implies a long term perspective of the goal. The market price of a share reflects all expected future benefits flowing from the firm to its shareholders, and therefore, the management cannot emphasize the short term profits at the cost of long term perspective.

In its operational terms, this objective seems to be practical and operative. The objective of wealth maximization implies that the market price of a share is linked to three basic financial decisions *i.e.* the investment decision, the financing decision and the dividend decision. The link between these decisions and the value of the share can be made by recognizing that the market price of a share is the present value of its expected cash flows, discounted back at a rate that reflects both the riskiness of the project and the financing mix used to finance it. The investors form expectations about future cash flows based on current cash flows and expected future growth. These expectations are reflected in the market price of the share.

However, there are certain problems with the implementation of the goal of maximization of shareholder's wealth. The main problem is the assumption underlying this goal *i.e.* there is an efficient capital market wherein the effect of a decision is truly reflected in the market of share. In practice, the share price in the market is subject to the influence of so many extraneous factors. The market price of a share is influenced by the overall economic and political scenario in the country. More often than not, the market price of a share may also fluctuate because of speculative activities. All these factors are assumed to be given and constant in this objective.

Moreover, this objective seems to be uncontroversial on theoretical grounds but in practice there are three basic stakeholders in any firm *i.e.* the shareholders, the professional managers and the creditors. The objectives of these three stakeholders in the firm are often very different resulting in conflict among them. Managers may take decisions that are in their best interest at the cost of making unhappy the shareholders and the creditors. The problem is further accentuated if the interest of other stakeholders *e.g.* employees, *etc.*, is also considered.

Profit Maximization *vs.* **Wealth Maximization:** The objective of profit maximizations measures the performance of a firm by looking at its total profit. It does not consider the risk which the firm may undertake in maximization of the profits. The profit maximization, as an objective does not consider the effect of earnings per share, dividends paid or any other return to shareholders on the wealth of the shareholders.

On the other hand, the objective of maximization of shareholder's wealth considers all future cash flows, dividends, earnings per share, risk of a decision, *etc.* So, the objective of maximization of the shareholder's wealth is operational and objective in its approach. A firm that wishes to maximize the profits may opt to pay no dividend and to reinvest the retained earnings, whereas a firm that wishes to maximize the shareholder's wealth may pay regular dividends. The shareholders would certainly prefer an increase in wealth against the generation of increasing flow of profits to the firm.

Moreover, the market price of a share, theoretically speaking, explicitly reflects the shareholders expected return, considers the long term prospects of the firm, reflects the differences in timing of the returns, considers risk and recognizes the importance of distribution of returns. Therefore, the maximization of shareholder's wealth as reflected in the market price of a share is viewed as a proper goal of financial management. The profit maximization can be considered as a part of the wealth maximization strategy, but should never be permitted to over-shadow the latter. Throughout this work, the objective of maximization of shareholders' wealth has been taken as the primary goal of financial decisions making.

Some Other Objectives : The objectives of profit maximization and maximization of shareholders' wealth are single point objectives. Though the latter is regarded as the undisputed objective of financial management, yet it may also pose problems in a particular situation. Therefore, the objective of financial management may be taken as to achieve a reasonable level of satisfaction, both for the shareholders as well as the management. The financial decisions under this approach may be taken in order to protect the interest of both instead of achieving maximum benefit for one of these two only. The objective of satisfying the shareholders as well as the management is based on premise that the shareholders must get some minimum profit within a reasonable level of risk so that the market price of a share is not unduly affected. This objective presupposes and that is true also that it may not always be possible to achieve the best but a satisfactory level can definitely be achieved.

Conflict Among Goals: In a business firm, there may be different departments such as sales departments, purchase department, production department, marketing department, etc., and often a conflict may appear among the goals of these departments and this conflict must be resolved. Moreover, the internal operative goal of a department may conflict with the goal of the firm. This conflict may arise as the departmental head may stick to internal objective only and fails to visualize (of course in deliberately) the ultimate corporate goal.

Sometimes, the management may concentrate on easily attainable and measurable goals such as increase in sales revenue or production, etc., and ignore the effect of these variables on the market price of a share. The management may also be forced by the external factors to adopt a course of action which is expected to give less than maximum results. As a result, the firm may be prevented from pursuing the goal of maximization of the shareholder's wealth. In case of corporate firms, the ownership (*i.e.*, the shareholders) is separated from the management (*i.e.*, the board of directors). Usually, the shareholders are ill organized and scattered which results in the fact that the shareholders have no active interest and participation in the decision making of the company. On the other hand, the management having functional autonomy may tend to develop its own goals. This may also result in differing view points of the ownership and the management. The professional management may alienate from the viewpoint of the shareholders and a conflict may arise between the two.

On the whole, the maximization of the shareholders wealth seems to be a normative goal towards which the firm should strive. A finance manager though operating with the objective of maximization of shareholders wealth need not undermine the importance of other goals. He must take decisions only after weighing the relevant considerations.

RISK AND RETURN : BASIC DIMENSIONS OF FINANCIAL DECISIONS

In financial management, the risk is defined as the variability of expected returns from an investment. For example, an investor makes a fixed deposit at an interest of 10% p.a. for a particular period with a scheduled bank. There is virtually no risk attached with this investment since there is no variability associated with the return. However, if the same amount is used to buy the equity shares of a company, then the return in the form of dividends from this investment may vary from one year to another. So, the investment in equity shares is risky as the returns are variable. The more certain the returns from asset/investment, the less is the variability and therefore, less the risk. It may be noted that the terms risk and uncertainty are usually used interchangeably. However, the risk exists when the decision maker is able to estimate the probabilities associated with the different outcomes. On the other hand, the uncertainty exists when the decision maker has no historical data to develop the probabilities associated with the outcome.

Return associated with a decision is measured as the total gain or loss expected over a given period of time by the decision maker. It may be defined as the return on the original investment made in the particular asset/investment.

As pointed out earlier, a finance manager has to take various types of decisions classified as investment decisions, financing decisions and dividend decisions. A finance manager takes these decisions in the light of objective of maximization of shareholders' wealth as reflected in the market price of the share. The finance manager should also know as to what are the factors which may affect the market price of a share. The

various decisions will then be taken in the light of these factors, otherwise any attempt to achieve the objective of maximizations of the market price of the share may be frustrated.

There are numerous factors which may influence the market price of a share. Some of these factors may be political conditions, economic conditions, investment scenario, company considerations, promoter groups, *etc.* A finance manager may face problems when trying to include all these factors in the decision making process. He is required to optimise these factors while taking financial decisions.

He should also understand that every financial decision has two aspects *i.e.* the risk and the return. There is a risk involved in every decision. The degree of risk, however, may differ from one decision to another. A riskless decision is difficult to be visualized. Further, every decision has a return also. It may be emphasized that the risk and return go together and there is always a conflict between the return from a decision and the risk it brings into the firm.

A finance manager cannot avoid the risk altogether nor can he make a decision by considering the return aspect only. Usually, as the return from an investment increases, its risk also increases. In an attempt to increase the return, the finance manager will have to undertake greater degree of risk also. Therefore, a finance manager is often required to trade off between the risk and return. At the time of taking any financial decision, the finance manager has to optimize the risk and return. A particular combination of risk and return where both are optimized may be known as **Risk-Return Trade off**. Every financial decision involves such trade off between risk and return. At this level of risk-return, the market price of the share will be maximized.

But what is the relationship between risk-return and market price of the share? The financial decisions affect the market price of a share not directly but by affecting the risk and profitability of the firm. This relationship has been depicted in Figure 1.2.

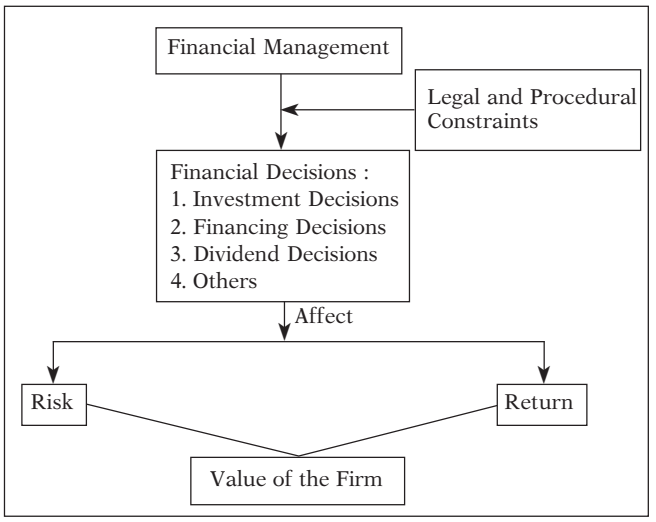

FIG. 1.2 : FINANCIAL MANAGEMENT, RISK-RETURN AND VALUE OF THE FIRM

Figure 1.2 shows that various types of financial decisions are taken within the limits set by legal and procedural constraints. These decisions then affect the risk-return composition of the firm. This risk-return composition in fact, ultimately affect the value of the firm reflected in the market price of a share. In other words, the financial decisions which are made subject to legal constraints, affect both risk and return which jointly determine the value of the firm. The above discussion shows that the financial management:

- is concerned with various types of decisions,
- has an operational goal of maximization of shareholders' wealth,
- includes the analysis of different types of information,
- evaluates the risk and return perspective of all alternatives,
- encompasses the management of long-term as well as short-term assets.

FINANCIAL MANAGEMENT AND OTHER AREAS OF MANAGEMENT

In the management of business firms, there are various well known functional areas such as Production Management, Materials Management, Marketing Management, Human Resource Management, *etc.* In addition to these areas, there is an area of Financial Management also. All these functional areas are interrelated and practically equally important in any firm. The financial management provides oxygen to the life of a firm by providing uninterrupted flow of funds throughout the firm and, thus, helps in achieving the ultimate objectives of the firm. The finance function is related to every other functional area of the management, wherever and whenever a policy decision is to be taken. The reason is obvious. Every policy decision involves some or other financial implication. The relationship between financial management and other functional areas has been analysed in the following discussion.

Financial Management and Production Department

The production department in any firm is concerned with provision of production facilities, production cycle, skilled and unskilled labour, storage of finished goods, capacity utilization, *etc.* The financial management has a useful role to play in interaction with the production management as the cost of production assumes a substantial portion of the total cost. The production department may be required to take various decisions like increase in capacity utilization, installation of a safety device, replacing a machinery, installation of materials monitoring device, improvisations of production facilities, *etc.* All the decisions have financial implications and therefore, should be evaluated in the light of the objective of the maximization of the shareholders wealth. So, the financial management has a role to play.

Financial Management and Materials Department

The materials management is of utmost importance in a manufacturing firm and covers the areas such as procurement, storage, maintenance and supply of materials and stores. This entails keeping the material in good condition and sufficient quantity so that the production schedule continues smoothly. The inventory of any items is required to be maintained at an optimum level *i.e.*, neither excessive nor inadequate.

The financial management and materials management interact with each other and the financial management has a specific role to play. It is no denying the fact that, generally, the materials constitute a substantial portion of the cost of production which can be controlled and possibly can be reduced also by keeping a strict vigil on the financial implications of material movement in the firm. The finance manager and the materials manager may come together while determining the Economic Order Quantity, Safety Level, Storing Place requirements, Stores Personnel requirements, *etc.* The cost aspects of all the decisions are to be evaluated against the expected savings. For this, the finance manager has to come forward to help the materials manager.

Financial Management and Personnel Department

The personnel department of a firm is entrusted with the responsibility of recruitment, training and placement of the staff for the firm. The department is also required to critically analyze and suggest means to reduce if any, the manpower requirements for various departments of the firm. This department is also concerned with the welfare of the employees and their families. In this connection, different decisions are to be taken from time to time. Some of these decisions may be compulsive under the legislative provisions while other may be discretionary.

The personnel department has to work with the finance manager while evaluating different schemes of training programmes, employees welfare, economy in manpower, computerization, incentive schemes, revision of pay scales, *etc.* The best possible option should be identified keeping in view both the employee's welfare and the interest of the firm. Considering the financial implications of all these decisions is an important dimension.

Financial Management and Marketing Department

The marketing department of a firm is concerned with the ultimate activity of the firm *i.e.*, the selling of goods and services to the customers. The marketing department is entrusted with the responsibility of framing marketing, selling, advertisement and other related policies to achieve the sales target. It is also required to frame credit and collection policies to maintain and increase the market share, creating a brand name, to acquire a competitive edge, *etc.*

For example, the marketing department should not arbitrarily relax the credit terms (just in order to increase the sales figure) as it may affect the liquidity position of the firm. The financial implications of the proposed advertisement policy, price-war manoeuvres, liberalization of credit policy, *etc.*, must be critically analyzed before these are adopted and implemented.

Thus, financial management is closely linked with different functional areas of management. Since financial management is involved in overall planning and control of funds of the entire firm, it is related to each and every segment of operations of the firms. That is why it is generally said that finance department has more important place than others.

SOME BASIC PROPOSITIONS AND AXIOMS OF FINANCIAL MANAGEMENT

On the basis of the discussion so far, one can make certain propositions about the financial management as follows :

1. **The financial management matters to everybody.** Almost every decision made by a firm or an investor has a financial aspect. Although, not every one will find a use for all the components/techniques of financial management, every one will find a use for at least some part of it.
2. **The best way to understand the financial management is to view it as an integrated body** consisting of three basic decisions *i.e.*, the investment decision, the financing decision and the dividend decision. These decisions may seem to be independent of each other, but these are invariably interlinked.
3. **The financial management has an internal consistency** that flows from its choice of wealth maximization as its objective and some of its basic principles *e.g.*, risk has to be rewarded; cash flows matter more than accounting profit ; every decision a firm makes has an effect on its value.
4. **The financial management is analytical in nature.** It is quantitative in its focus, but a significant component of creative and analytical thinking is involved in coming up with solutions to financial problems of any firm.

The theory of financial management, as will be observed throughout this text, is based upon 6 basic axioms as follows:

(*i*) **The Time Value of Money :** It refers to the fact that a rupee received today is worth more than a rupee receivable in future. The implications and applications of this axiom have been discussed in detail in Chapter 2.

(*ii*) **The Risk-Return Trade off:** This axiom has already been explained and refers to that no investor will take additional risk unless he expects to be compensated with additional return. This axiom has been extensively referred to throughout the text.

(*iii*) **The Cash Flows and Accounting Profits:** This axiom refers to the difference between the accounting profit which is based upon the accounting concepts and conventions, and the cash flows which are based on the movement of cash. In financial management, the cash flow is the basic measuring tool. This has been discussed in detail in Chapter 3.

(*iv*) **Incremental Cash Flows:** In all financial decisions, the conscious effort is to think incrementally *i.e.*, what the cash flow will be if a particular decision is taken *versus*

what they will be if the decision is taken otherwise. This axiom has also been explained in detail in Chapter 3.

(*v*) **Subservient to Tax Laws :** All financial decisions are subservient to tax laws. It means that the tax implications are incorporated before a decision is made.

(*vi*) **Efficient Capital Market:** It has already been explained that the objective of financial management is to maximize the wealth of the shareholders as reflected in the market price of the share. The effect of different financial decisions is fully and instantaneously reflected in the market price of the share. The implication is that the market price is right and reflects all publicly available information.

These axioms have been used throughout the text. However, it is not necessary to understand finance in order to understand these axioms, but it is definitely necessary to understand these axioms to understand financial management.

TREASURY MANAGEMENT

Cash management or management of cash flows is a key function for the success of any firm. The scope of the cash management function has widened a lot. Particularly in large firms, cash management has given place to Treasury Management. As a result of increasing competition and global business environment, what is required is the specialist's knowledge and skill to deal with cash management. The term treasury management may be used to denote the following :

(*a*) **Liquidity Management:** This includes provision of sufficient cash to the firm as and when the need arise. All types of fund requirements, short-term as well as long-term, are to be met. Adequate planning and budgeting exercises are required to point out the liquidity-slack and liquidity-surplus periods. Mismatch of cash inflows and cash outflows with respect to timing of their occurrence and amount thereof are identified and corrective actions are planned. Liquidity management is discussed in detail in Chapter 14 of the book.

(*b*) **Foreign Exchange Management:** This is also called the Currency Management. Firms involved in cross border transactions, have to deal with the foreign currencies. These firms have to exchange the local currency into foreign and *vice versa* to meet their import and export commitments. Foreign exchange rates are fluctuating from moment to moment. In order to minimize the exchange rate risk exposure of the firm, necessary forward contracts or other actions are required.

(*c*) **Risk Management:** Besides the foreign exchange rate risk, there are other risks also to which firms are exposed. These include credit risk, business risk, financial risk, interest rate risks, political risks, *etc.* Treasury management deals with the identification of these risk exposures and to keep the total risk of the firm to a minimum extent possible.

Thus treasury management encompasses the following :

(*i*) Management of cash and liquidity with optimum cost and return.

(*ii*) Identification and management of exchange rate risks and other risks.

(*iii*) Maintaining good relations with supplier of funds, particularly the investors and shareholders.

(*iv*) Looking after the financial implications of strategic and policy decisions.

(*v*) Interaction with the financial market in general and with the capital market, in particular.

FINANCIAL MANAGEMENT AND FINANCIAL ACCOUNTING : COMPLEMENTARY COMPANIONS

Financial Accounting is defined as the process of identifying, measuring and recording the economic transactions in any organizations with a purpose to provide informations to various users for their decision making. This information is provided in the form of various accounting formats such as Income Statement, Balance Sheet, Funds Flow Statement, Cash Flow Statement, etc. These statements are prepared on the basis of (*i*) standardized and generally accepted accounting principles, and (*ii*) on the premise that the revenues should be recognized at the point of sale and expenses should be recognized when they are incurred. This is referred to as ***accrual system of accounting.*** Financial Accounting provides the operating results of an organization for a particular period. It also helps in finding out the true and fair value or worth of the business at a point of time. The information given in the income statement and the balance sheet regarding the operating results and the worth of the business can be used for taking different type of decisions.

Financial management on the other hand, deals with the financial decisions making. In financial management the emphasis is laid on the optimum utilization of funds and raising the funds at an optimum cost at an appropriate time. The financial management is concerned with the management of funds. The finance manager aims at the maintenance of firm's solvency and liquidity by providing the cash flows necessary to meet the requirements of the firm from time to time. Instead of recognizing revenues at the point of sales and expenses when they are incurred, the financial management recognizes the revenues and expenses only with respect to cash inflows and cash outflows. A firm may be profitable from accounting point of view but may not have sufficient cash to meet its obligations. The financial management emphasizes the cash flows rather than profit.

On the face of it, the financial accounting and the financial management are different from each other. Financial accounting is concerned primarily with the recording of the facts and the transactions in monetary terms. But the financial management is concerned with taking decisions on the basis of different types of information (including that provided by the financial accounting) for the maximization of shareholder's wealth. The information collected in financial accounting is used by the financial manager in the decision making process. The financial accounting is basically information collection procedure whereas the financial management is the decision making process. The finance manager

cannot proceed unless he gets sufficient information from the accounting department. So, the two are complementary and the financial management starts where the financial accounting ends. The relationship between financial accounting and financial management can be summarized as follows :

1. Financial Accounting provides the relevant information on the basis of which the earnings per share, the cash flows, *etc.*, can be ascertained for further use in financing decisions and investment decisions by a finance manager.
2. Necessary information for receivables management, liquidity management, payable's management, *etc.*, are provided by the financial accounting to the finance manager.
3. Financial accounting provides the information about the available profits (after tax and other appropriations). This information is a necessary requisite for framing the dividend policy of the firm.
4. The objective of financial management is to maximize the shareholder's wealth as reflected in the market price of the share which is influenced to a large extent by the profit figure as shown in the financial statements.

To sum up, the financial management uses the information provided by the financial accounting to make decisions so that the firm can achieve its objective. Financial Managers need financial information to evaluate their own decisions and for this, they must understand the financial consequences of their decisions. The financial accounting and the financial management differ from each other as well as are complement to each other. The efficiency and the effectiveness of the decisions taken by a finance manager is largely determined by the accuracy of information provided by the financial accounting. However, this does not mean that an accountant never makes decisions or a finance manager never collects data. The financial accounting and financial management may be different in their primary focuses but ultimately have a complementary role to play in the decision making process of a firm.

FINANCIAL SYSTEM AND ENVIRONMENT IN INDIA : AN OVERVIEW

A financial system is consisting of different financial assets, financial intermediaries, financial market, borrowers and investors. An efficient financial system is of critical importance for the economic development of any country. Indian financial system is consisting of two sectors. The unorganized sector and the organized sector. The unorganized sector, scattered particularly in rural India, is outside the purview of the regulations and control of the Government authorities. The organized sector, on the other hand, is consisting of different elements *i.e.*, the financial assets, financial intermediaries and financial markets and is well regulated by a network of Government authorities.

Financial Market

A financial market may be defined as the market of financial assets *i.e.*, the market in which the financial assets are transacted. Issue of shares and debentures by a company, issue of mutual fund units, working capital loans by commercial banks, long-term financial assistance by financial institutions, inter-bank call money transactions are a few examples of financial transactions which are undertaken in financial markets. The financial market may be divided into four parts *i.e.*, the money market, the capital market, the Government securities market and the foreign exchange market.

The ***Money market*** is a market for short term debt transactions. The money market in India consists of informal money market and formal money market. The informal money market includes the indigenous money lenders, nidhis, chit funds, etc. Their operations are not governed by Government regulations but by traditional practices. Usually, their operations are restricted to a particular geographical area only. The basic characteristics of the informal money market are informal procedures, high rate of interest, flexible terms and loan as per mutual convenience of the parties, *etc.*

The formal money market is basically characterized by the presence of the Reserve Bank of India, Discount and Finance House of India Limited, Mutual Funds, Non-Banking Financial Companies, Commercial Banks, Financial Institutions, etc. These participants in the formal money market transact in Treasury Bills, Inter-Bank Call Money, Commercial Bills of Exchange, Inter-Corporate Deposits, *etc.* The basic characteristics of the formal money market are : (*i*) regulated by the RBI by way of regulation of interest rate and reserve requirements of commercial banks, (*ii*) fairly strict and rigid rules of operations, and (*iii*) low rates of interests. In the money market, funds are available for periods ranging from a single day upto a year.

The ***Capital market*** is a market for long-term financial assets such as shares, bonds, debentures, mutual fund units, *etc.* It can be divided into New Issue Market (primary market) and Secondary Market. The New Issue Market provides a system wherein different companies, mutual funds and institutions issues (sells) their financial instruments *e.g.* shares, debentures etc. and the investors (both individuals and institutional) subscribe (buys) these instruments. The New Issue Market in India is well regulated by the Securities and Exchange Board of India (SEBI) which has issued guidelines for the issue of these instruments. The secondary market is the market in which the subsequent sale and purchase of these securities and instruments are undertaken. The secondary market is basically provided by the stock exchanges. At present, there is a network of stock exchanges operating in India. The stock exchanges and their transactions are regulated by the Securities Contracts (Regulation) Act, 1956 and Guidelines issued by the SEBI. The screen based trading, the scripless trading and the depository system are a few highlights of Indian Capital Market.

The ***Government securities market*** is a market where the securities/loans of Central Government, State Governments and other Government authorities are traded. These securities, primarily in the form of Government loans, are also known as Gilt-edged securities. The main participants in the

Government securities market are the commercial banks, provident funds, *etc.* Interest rates on these securities are low.

The ***Foreign Exchange Market*** refers to the network of dealers of foreign currencies. These dealers provide services : (*i*) to convert one currency into another currency, and (*ii*) to make available various types of structured products dealing with the foreign exchange risk.

Financial Assets

The financial assets are not the assets such as real assets, physical assets or tangible assets. Rather, financial assets represent a financial claim of the holder over the issuer of the financial assets. A financial asset is a liability of the issuer towards the holder. Besides the currency issued by the RBI or the Government of India, the other financial assets are usually classified into shares, mutual fund unit and debt instruments, deposits and loans.

A **share** represents an ownership interest in the assets of a company. The companies in India are allowed to issue two types of shares *i.e.* the equity shares and the redeemable preference shares. The rate of dividend on the preference shares is fixed and therefore, a preference share may be called a hybrid security having features of debt as well as of a share. The equity shares represent a true ownership right. The rate of dividend is not fixed rather, it depends upon the earnings of the company.

The **debt instruments** are the loan instruments and hence repayable on the maturity. For the intervening period, the interest is payable as per terms and conditions of the issue. In India, debt instruments with diverse features have been issued by companies and financial institutions. Some of these are bonds, debentures, secured premium notes, partly convertible debentures, deep discount bonds, zero interest debentures, optionally convertible debentures, *etc.* The companies in India can also avail long-term financial assistance from financial institutions and commercial banks. Recently, lease financing has also emerged as a variant of debt financing.

A **mutual fund** unit is basically an instrument of channelizing the savings of individuals so that these collective savings can be utilized for meeting the financial requirements of the industry. The incomes on these units is distributed among the unit-holders. In 1964, the Unit Trust of India was established as the first mutual fund in India. Since then, many other mutual funds have been established in the public sector as well as the private sector. These mutual fund units are listed and can be traded at stock exchanges. In case of open-end mutual fund units, the units can be offered by the holder for the 'repurchase' at a price which is calculated on the basis of net assets value (NAV) of the unit.

There are different provisions contained in the Companies Act, 2013 and the Securities Contracts (Regulation) Act, 1956 for the issue of shares and debentures. The SEBI, after it came into being in 1992, has issued a number of guidelines for the issue and transactions in different types of financial instruments. It has also framed guidelines for the credit rating of debt instruments, deposits invited by companies and other related aspects.

Financial Intermediaries

The financial institutions are the key players or the market men of any financial system. The financial intermediaries in fact play a role of establishing a link between the debtors and the creditors in the financial system. The financial intermediaries in India may be classified as follows :

- All-India level financial institutions such as the IDBI, SIDBI, NABARD *etc.*
- The State-level financial institutions such as the Delhi Financial Corporation, Haryana Financial Corporation.
- The commercial banks.
- The insurance companies.
- The mutual funds.
- The non-banking financial companies including leasing and hire purchase companies and chit funds.

Regulatory Framework

The regulatory framework for controlling and supervising the financial system in India is an overlapping and complex network of legislations, guidelines, notifications, *etc.* The main elements of the regulatory framework are :

- The Companies Act, 2013.
- The Securities Contracts (Regulation) Act, 1956.
- The Income-tax Act, 1961.
- The Banking Regulation Act, 1949.
- Numerous Guidelines issued by SEBI and the RBI.
- Credit Policy announced by the RBI, *etc.*

POINTS TO REMEMBER

- The term financial management is concerned with flow of funds in any firm. It is concerned with financial decision making and thereby deals with raising of funds and their optimum utilization.
- Since all decisions have financial implications, the financial management is related to almost every aspect of business operations.
- Traditionally, financial management was concerned with raising of funds only. Hence, it was episodic in nature and finance function was treated from the point of view of supplier of funds only.
- After 1950, finance has emerged as an integrated functional management. Now, the financial management is seen as a decision making process.
- The scope of the finance function has emerged to include :
  - (*a*) What should be the size of the firm and how fast should it grow?

(*b*) What are the various types of assets to be acquired?

(*c*) What should be the pattern of raising funds from various sources?

- While performing these functions, a financial manager is required to take different decisions, which may be classified into :
- Investment decisions (relating to resource allocation) Financing decisions (relating to capital structure) and Dividend decisions (relating to distribution and retention of profits).
- The objective of financial decision making is defined as maximization of wealth of shareholders as reflected in the market price of the share. This objective is considered superior to profit maximization which is vague, ambiguous and ignores risk.
- Time Value of Money, Risk-Return trade off and Cash-flows are some of the basic concepts of financial management.
- Financial Accounting and Financial Management are complementary in nature. The former provides data for the latter.

OBJECTIVE TYPE QUESTIONS

State whether each of the following statements is ***True (T)*** *or* ***False (F)****.*

(*i*) In the traditional approach, the scope of financial management was restricted to procurement of funds.

(*ii*) In financial management, the objective of financial manager is profit maximization.

(*iii*) Financial management refers to financial decision making.

(*iv*) Over last few decades, the scope of financial management has broadened.

(*v*) Financial management and financial accounting are essentially same.

(*vi*) The basic objective of financial manager is the maximization of wealth of shareholders.

(*vii*) Risk and return are two basic dimensions of any financial decision.

(*viii*) Financial management interacts with other departments of the firm and determines the future growth of the firm.

(*ix*) Profit maximization and wealth maximization are essentially the same thing.

(*x*) Investment, financing and dividend decisions works collectively to determine the growth of the firm.

[**Answers :** *(i) T, (ii) F, (iii) T, (iv) T, (v) F, (vi) T, (vii) T, (viii) T, (ix) F, (x) T.*]

MULTIPLE CHOICE QUESTIONS

1. Objective of Financial Management is :

(*a*) Management of Liquidity,

(*b*) Maximization of Profit,

(*c*) Maximization of Shareholders' Wealth,

(*d*) Management of Fixed Assets.

2. In Financial Management, cash flow is same thing as :

(*a*) Cash Profit,

(*b*) Profit before Tax,

(*c*) Operating Profit,

(*d*) None of the above.

3. What is ignored in Principle of Profit Maximization ?

(*a*) Time Value of Money,

(*b*) Risk,

(*c*) Wealth Creation,

(*d*) All of the above.

4. Which of the following are two basic concepts of financial management ?

(*a*) Costs and Expenses,

(*b*) Risk and Return,

(*c*) Debit and Credit,

(*d*) Receipts and Payment.

5. In Financial Management, the term risk refers to :

(*a*) Chances of Incurring Losses,

(*b*) Variability of Future Outcome,

(*c*) Chances of no Return,

(*d*) None of the above.

6. Financial Management refers to :

(*a*) Management of Current Assets,

(*b*) Management of All Assets,

(*c*) Financial Decision-making,

(*d*) Management of Liabilities.

7. Which of the following is included in financial decision making ?

(*a*) Investment Decision,

(*b*) Financing Decision,

(*c*) Dividend Decision,

(*d*) All of the above.

8. Which of the following is considered as complementary to Financial Management ?
   (*a*) Cost Accounting,
   (*b*) Management Accounting,
   (*c*) Financial Accounting,
   (*d*) Corporate Accounting.
9. Maximization of Wealth of Shareholders is reflected in :
   (*a*) Sales Maximization,
   (*b*) No. of Shareholders,
   (*c*) Market Price of Equity Shares,
   (*d*) SENSEX.
10. Which is not a part of Investment Decision in Financial Management ?
   (*a*) Dividend Payout Decision,
   (*b*) Capital Budgeting Decision,
   (*c*) Working Capital Management,
   (*d*) Credit Policy towards Customers.
11. Focal Point in Financial Management is :
   (*a*) Increasing Sales of the firm,
   (*b*) Creating Shareholders' Value,
   (*c*) Increasing Profit,
   (*d*) Increasing Market Share.
12. Which of the following variables defines and explains the concepts of finance ?
   (*a*) Inflation,
   (*b*) Capital Structure,
   (*c*) Risk-free Rate of interest,
   (*d*) Risk and Return.
13. In a Public Sector Company, the financial goal of the firm is to :
   (*a*) Maximize the Market Price of Equity,
   (*b*) Maximize the Dividends to Govt.,
   (*c*) Maximize the PV of Equity Returns,
   (*d*) None of the above.
14. Maximizing the wealth of the shareholders is reflected in :
   (*a*) Maximizing MP of Equity Shares,
   (*b*) Maximizing Cash Balance,
   (*c*) Maximizing Retained Earnings,
   (*d*) Maximizing Issued Capital.
15. Which of the following is not a function of a finance manager ?
   (*a*) Procurement of Fund,
   (*b*) Allocation of Fund,
   (*c*) Maintaining balance between Risk and Return,
   (*d*) Manoeuvring the Share Price.
16. Market value of the firm is a result of :
   (*a*) Investment Decision,
   (*b*) Financing Decision,
   (*c*) Working Capital Management,
   (*d*) Risk-Return Trade off.
17. Which of the following represents the financing decision ?
   (*a*) Designing Optimal Capital Structure,
   (*b*) Declaring Dividend,
   (*c*) Paying Interest on Loans,
   (*d*) None of the above.
18. Dividend decision is related to :
   (*a*) Right Issue of share,
   (*b*) Reinvestment Requirement,
   (*c*) Cash Flow Statement,
   (*d*) None of the above.

[**Answers :** *1(c); 2(d); 3(d); 4(b); 5(b); 6(c); 7(d); 8(c); 9(c); 10(a); 11(b); 12(d); 13(c); 14(a); 15(d); 16(d); 17(a); 18(b)*]

ASSIGNMENTS

1. Write short notes on:
   (*a*) Wealth maximization.
   (*b*) Functions of finance manager.
   (*c*) Treasury Management.
2. Explain how the scope of finance function has changed overtime. What role a finance manager play in a modern firm? *[B.Com. (H.), D.U., 2014]*
3. The modern approach to corporate finance is an improvement over the traditional approach. Comment.
4. Draw a typical organization chart highlighting the finance function of a company.
5. Explain wealth maximization and value maximization objectives of financial management.
6. "An optimal combination of decisions relating to investment, financing and dividends will maximize the value of the firm to its shareholders". Examine.
7. "It has been traditionally argued that the objective of a firm is to earn profit, hence, the objective of financial management is also profit making". Comment.
8. "Financial management is nothing but managerial decision making in asset mix, capital mix and profit "allocation". Comment. *[B.Com. (H.), D.U., 2013]*

9. Examine inter-relationship among the investment, financing and dividend decisions.
10. What are the principles of financial decision making? Explain and illustrate the factors which should be kept in mind while taking financial decision.
11. "Financial management is more than procurement of funds". What do you think about the responsibilities of a finance manager? *[B.Com. (H), D.U., 2004, 2005]*
12. "The profit maximization is not an operationally feasible criterion". Do you agree? *[B.Com. (H), D.U., 2010]*
13. When can there be conflict between owners and management's goals? How wealth maximization takes care of this?
14. How the financial decision making involve risk-return trade-off? *[B.Com. (H), D.U., 2013]*
15. "Financial decision making is the hallmark of financial management". Examine in the light of this statement, the important financial decisions in a firm.
16. "Financial management has expanded in its scope during last few decades". Examine the modern approach to the scope of financial management. *[B.Com. (H), D.U., 2013, 2018]*
17. "Financial Management is concerned with the solutions of three major decisions a firm must make, the investment, the financing and the dividend decisions." Explain this statement highlighting the inter-relationship amongst these decisions. *[B.Com. (H), D.U., 1999, 2016]*
18. Investment, Financing and Dividend decisions are all interrelated. Comment. *[B.Com. (H), D.U., 2000, 2007, 2012]*
19. "The corporate firm will attempt to maximize the shareholder's wealth by taking action that increase the current value per share of existing stock of the firms." (Ross). Comment. *[B.Com. (H), D.U., 2001]*
20. "Growth is a realistic objective of a joint stock company for financial decision making". *[B.Com. (H), D.U., 2002]*
21. "The Finance Manager has no role to play in a dot.com company". Comment. *[B.Com. (H), D.U., 2002]*
22. "The financial goal for a firm should be to maximise profit and not wealth." Do you agree? Comment. *[B.Com. (H), D.U., 2003]*
23. "Wealth Maximization is only a decision criterion and not a goal." Explain. *[B.Com. (H), D.U., 2004, 2018]*
24. Explain the concept of 'profit maximization' and 'wealth maximization'. Which of these is better operational guide for finance manager? *[B.Com. (H), D.U., 2007]*
25. What are the basic financial decisions? How do they involve risk-return trade off? *[B.Com. (H), D.U., 2008]*
26. Financial Accounting and Financial Management are complementary in nature. Do you agree? Explain. *[B.Com. (H), D.U., 2009]*
27. "Wealth Maximization is a better criterion than profit maximization." Do you agree ? Explain. *[B.Com. (H), D.U., 2011, 2016]*
28. Why is it inappropriate to seek profit maximization as the goal of financial decision making? How would you justify the adoption of wealth maximization as an apt substitute for it? *[B.Com. (H), D.U., 2015]*
29. What do you mean by financial management? How is it different from financial accounting? *[B.Com. (H), D.U., 2015]*
30. Profit maximisation is a better criterion than wealth maximisation. Do you agree? Explain *[B.Com. (H), D.U., 2017]*
31. Discuss the main decisions which are taken in financial management. *[B.Com. (H), D.U., 2017]*

CHAPTER

2

The Mathematics of Finance

"The concept of interest is one of the central ideas in finance. Individuals, as well as business organizations, frequently encounter situations that involve cash receipts or disbursements over several periods of time. When this happens, interest rates and interest payments become important and sometimes vital considerations."[1]

SYNOPSIS

- Concept and Relevance of Time Value of Money.
- Compounding Technique.
  - The Future Value of a Single Cash Flow.
  - The Effective Rate of Interest.
  - The Future Value of a Series of Cash Flows.
- Discounting Technique.
  - Present Value of a Future Cash Flow.
  - Present Value of a Series of Future Cash Flows.
  - Present Value of a Perpetuity.
  - Present Value of an Annuity Due.
  - Present Value of a Growing Perpetuity.
  - Present Value of a Growing Annuity
- Applications of the Concept of Time Value of Money.
  - Finding out Implied Rate of Interest.
  - Finding out Number of Periods.
  - Sinking Funds.
  - Capital Recovery.
  - Deferred Payments.
- Graded Illustrations in Time Value of Money.

1. Neveu R.P., *Fundamentals of Managerial Finance*, South Western Publishing Co., Ohio, 1981, p. 210.

In the preceding chapter, it has been pointed out that in order to achieve the objective of the financial management *i.e.*, the maximization of the wealth of the shareholders, the finance manager has to take various decisions. The decisions *i.e.*, the investment decision, the financing decision and the dividend decision involve evaluation of various alternative series of cash flows occurring over time. For example, a finance manager is evaluating a proposal of replacing an existing machine by a new machine for which 3 options are available *i.e.*, machine A, machine B and machine C. These 3 machines may differ from one another in respect of cost, life, scrap value, annual benefits, repairs, maintenance, *etc.* The finance manager while making a comparative study of these options may find that the cash flows (in the form of cost, benefits, repairs, *etc.*) are different not only in quantum but also with respect to timings of their occurrences. One machine may give lower but early returns, while the other may give higher returns but at a later stage. One machine may be less costly while other may be costlier.

These series of cash inflows and cash outflows arising out of a decision are not comparable. The simple reason being that one rupee of time period 1 is not comparable with one rupee of some other time period. However, one rupee of different time periods can be made comparable by introducing the interest factor.

This interest factor is one of the crucial and exclusive concept of the theory of finance. This concept is also known as the concept of **time value of money** (TVM). In Chapter 1, the time value of money has been referred to as an axiom of financial management. The present chapter attempts to explain the concept and applications of Time Value of Money (TVM).

CONCEPT AND RELEVANCE

The concept of TVM refers to the fact that the money received today is different in its worth from the money receivable at some other time in future. In other words, the same principle can be stated as that the money receivable in future is less valuable than the money received today. The English Proverb 'A bird in hand is worth two in the bush', possibly gives the correct implications of the concept of TVM. Every individual or a firm definitely has a preference to receive money today against the money receivable tomorrow. For example, if an individual is given an option to receive ₹ 1,000 today or to receive the same amount after one year, he will definitely choose to receive the amount today (of course he is presumed to be a rational being). The obvious reason for this preference for receiving the money today is that the rupee received today has a higher value than the rupee receivable in future. This preference for current money as against future money is known as the time preference for money or simply TVM.

This concept of TVM is applicable in equal strength to individuals as well as to the business firms. In case of most of the decision particularly those taken by a firm, the financial implications may occur over a period of time and quite often over a long period of time even upto ten years or more. Therefore, TVM becomes an important consideration for any financial decision.

Why there is a time preference for money? Why every person has a preference to receive money now and gives the current money a higher value? There are several reasons for this preference for current money as follows :

1. **Future Uncertainties :** One of the reason for preference for current money is that there is a certainty about it whereas the future money has an uncertainty. There may be an apprehension that the other party (the creditor) may become insolvent or untraceable.
2. **Preference for Present Consumption :** Besides certainty, every person also has a preference for present consumption, though this preference may be subjective and differ from one person to another. The present money may be required for some specific purpose *e.g.* to buy a consumer durable or otherwise. Moreover, in an inflationary situation, the money received today has a greater purchasing power.
3. **Reinvestment opportunities :** Both the individuals and the firm have preference for present money because they have reinvestment opportunities available to them. If they have got the money, they can invest this money to get further returns on this. This opportunity to get returns will not be available if the money is not invested now. The existence of reinvestment opportunities and the urge to earn a return by investing this current money seem to be the obvious reason for the time preference for money. This expected return which can be earned by investing the present money is in fact the TVM.

This can be explained as follows : Say, a firm is selling a machine for ₹ 25,000. The buyer offers to pay ₹ 25,000 either now or after one year. The seller firm will naturally accept the first offer *i.e.*, to receive ₹ 25,000 now. In this case, if the firm reinvests the amount of ₹ 25,000 in fixed deposit account for one year at 10% p.a. interest, then after one year the firm will be having total money of ₹ 27,500 (₹ 25,000 + interest of ₹ 2,500). In the second option, the firm will receive only ₹ 25,000 after one year. Therefore, in the first option the firm will be better off by ₹ 2,500.

On the other hand, if the buyer of the machine is ready to pay ₹ 27,500 instead of ₹ 25,000 after one year, then the firm may be indifferent. In this situation, the firm will be having ₹ 27,500 after one year either (*i*) by receiving ₹ 25,000 now and reinvesting to get interest of ₹ 2,500 or (*ii*) to get ₹ 27,500 from the buyer after one year. This interest amount of ₹ 2,500 is the TVM.

In other words, the TVM is the rate of return which an investor can earn by reinvesting its present money. This rate of return can also be expressed as a required rate of return to make equal the worth of money of two different time periods.

Suppose, a firm purchases a machine at time 0, T_0, for ₹ 1,00,000 and it is expected to give a return of Rs 1,25,000 after one year *i.e.*, at time 1, T_1 The firm is incurring a cost of ₹ 1,00,000 today and will receive ₹ 1,25,000 after one year. The cash outflow and the inflow are occurring at different point of time and hence are not comparable. However, the two cash flows can be made comparable either by (*i*) expressing

₹ 1,00,000 in terms of worth of T_1 or (*ii*) expressing ₹ 1,25,000 in terms of worth of T_0. This may be shown as below :

₹ 1,00,000 — (adjustment) ⟶ ₹ 1,25,000
T_0 ..... T_1
₹ 1,00,000 ⟵ (adjustment) — ₹ 1,25,000

The two cash flows will be comparable only after adjusting in any of the two ways:

(*i*) By compounding ₹ 1,00,000 at the required rate of return of the firm for 1 year and comparing with ₹ 1,25,000, or

(*ii*) By discounting ₹ 1,25,000 at required rate of return of the firm for 1 year and then comparing with ₹ 1,00,000.

Since, in most of the financial decisions, a finance manager has to deal with monies of different time periods, he is often required to adjust the cash flows for TVM. That is why the concept of TVM is often regarded as the central concept of the theory of finance. A finance manager may frequently encounter situations that involve cash flows over several periods of time. For example, a fixed asset purchased today will generate cash flows (in terms of revenues generated), over number of years. A firm may raise funds today by issuing debentures on which interest will have to be paid for several years together with redemption amount in one or several instalments. Sound and effective decision making in respect of these and so many other similar situations should be based upon the cash flows that are comparable. The absolute cash flows of different time periods can be made comparable by applying the concept of TVM.

TVM is of crucial significance to any finance manager and become important and vital consideration while taking financial decisions. The concept of TVM helps in converting the different rupee amounts arising at different point of time into equivalent values of a particular point of time (present or any time in future).

These equivalent values can be expressed as future values (FV) or as present values (PV). The FV of a sum may be defined as the value of that amount if it was made at some time in future. For example, ₹ 1,000 is deposited in a bank account at 10% interest for a period of one year. This deposit of ₹ 1,000 will become ₹ 1,100 after one year (inclusive of interest). This ₹ 1,100 is the FV of today's ₹ 1,000 at 10% interest after one year.

On the other hand, the PV of a future money may be defined as the value of that money if it was received today. For example, PV of ₹ 1,100 receivable after one year is ₹ 1,000 considering the interest at 10% p.a. which could be earned by depositing ₹ 1,000 today for one year.

The relationship between the PV and the FV arises because of the existence of the interest rate and the time gap. The interest rate and the time gap between the present money and the future money in fact tie the PV and the FV together in a mathematical relationship as follows :

$$FV = PV \times (1 + r)^n \quad (2.1)$$

$$\text{and, } PV = FV/(1 + r)^n \quad (2.2)$$

where, r = % rate of interest, and
n = time gap.

For example, a deposit of ₹ 1,000 is made in a bank for three years with interest at 10% p.a. (annually cumulative). The FV of this deposit is :

$$FV = PV \times (1 + r)^n$$
$$= ₹\ 1,000\ (1 + .10)^3$$
$$= ₹\ 1,331$$

Similarly, the PV of ₹ 1,331 receivable after three years and considering the interest at 10% is as follows :

$$PV = FV/(1 + r)^n$$
$$PV = ₹\ 1,331/(1 + .10)^3$$
$$= ₹\ 1,000$$

Concepts of FV and PV are applied in financial decisions making. The cash flows of different time periods can be made comparable either (*i*) by compounding the present money to a future date *i.e.*, by finding out the FV of a present money, or (*ii*) by discounting the future money to present date *i.e.*, by finding out the PV of a future money. These techniques of compounding and discounting as a tool to incorporate the TVM in the financial decision making have been discussed as follows :

COMPOUNDING TECHNIQUE

The compounding technique is used to find out the FV of a present money. It is the same as the concept of compound interest, wherein the interest earned in a preceding year is reinvested at the prevailing rate of interest for the remaining period. Thus, the accumulated amount (principal + interest) at the end of a period becomes the principal amount for calculating the interest for the next period. The compounding technique to find out the FV of a present money can be explained with reference to :

1. The FV of a single present cash flow, and
2. The FV of a series of cash flows.

THE FV OF A SINGLE PRESENT CASH FLOWS : It is already seen that the FV may be defined in terms of Equation 2.1 as follows :

$$FV = PV\ (1 + r)^n$$

where, FV = Future value
PV = Present value (given)
r = % Rate of interest, and
n = Time gap after which FV is to be ascertained.

Equation 2.1 explains that the FV depends upon the combination of three variables *i.e.*, the PV, the r, and the n. If any one of these three variables changes, the FV will also change. There can be an almost infinite number of combinations of these three variables and, therefore, there can be corresponding infinite number of FVs. For example, one may be interested to find out the FV of ₹ 1,000 at 10% after 7 years or of

₹ 5,000 at 11% after 9 years or ₹ 50,000 at 16% after 3 years and so on.

The mathematicians have made these calculations easier by finding out the value of $(1 + r)^n$ for various combinations of 'r' and 'n'. These pre-calculated values of $(1 + r)^n$ for different combinations of 'r' and 'n' are given in Table A-1 in Appendix-II. By selecting a combination of 'r' and 'n' in Table A-1, one can read off the amount to which ₹ 1 will grow by the end of 'n' years at 'r' rate of interest. These pre-calculated values taken from this table when multiplied by the relevant PV will give the FV of that amount at rate of interest 'r', after 'n' years. For example, to find out the FV of ₹ 5,000 invested for 10 years at 5% rate of interest, one can search the Table A-1 for a combination of 5% and 10 years. The interaction of 5% column and 10 years row is the relevant figure. This figure is 1.629. This factor 1.629 multiplied by ₹ 5,000 will give the future value, FV, of ₹ 5,000 at 5% after 10 years.

i.e., FV = ₹ 5,000 × 1.629
= ₹ 8,145.

Similarly, one can find out the FV of other combinations of the PV, 'r' and 'n' with the help of Table A-1 which is also known as the compound interest table. Since this table gives the pre-calculated values of different combinations of 'r' and 'n', two observations can be made *i.e.*, (*i*) for a given period, higher the interest rate, the greater will be the FV and (*ii*) for a given rate of interest, the longer the time period, the higher will be the FV.

This factor, 1.629, is known as the Compound Value Factor (CVF) for a combination of r = 5% and n = 10 years. This can be denoted as $CVF_{(5\%, 10)}$ or $CVF_{(r, n)}$. So, the $CVF_{(5\%, 10)}$ is 1.629, and Equation 2.1 can be written as Equation 2.1 A *i.e.*,

$$FV = PV \times CVF_{(r, n)} \quad (2.1A)$$

Non-annual compounding : In the above discussion it is presumed that the time period 'n' is an annual period and that the compounding is made on annual basis only. However, the compounding period 'n' may be other than a year also. In such a case, the compounding formula given in Equation 2.1 is to be adjusted to reflect different number of periods. For example, if the compounding is made every 6 months, then the time period 'n' will become 2 times in a single year. Similarly, the interest rate is also to be adjusted, because the rate of interest will remain same but the interest amount of any 6 months will be compounded in the next 6 months and so on.

The more frequently the interest is compounded, the faster a FV grows. Further, more frequently the interest is compounded, it begins in turn to earn further interest and hence higher is the effective annual compound rate of interest.

For example, a deposit of ₹ 1,000 is made to earn interest at 12% p.a. compounded half-yearly. With semi-annual compounding, the interest for the first 6 months is added to the principal to calculate the amount of interest for the next 6 months. Since, the annual rate of interest is 12%, the interest rate for half-year period is taken as 6%. This means that the value of ₹ 1,000 after 6 months will be ₹ 1,060. This amount of ₹ 1,060 will now earn interest at 6% for the next 6 months *i.e.*, ₹ 63.60. Thus, the value of ₹ 1,000 with half-yearly compounding becomes ₹ 1,123.60 after 1 year, whereas it would have been ₹ 1,120 only if the compounding was made annually.

An easy way to calculate the FV of half-yearly compounding in the above situation is to interpret the situation as that ₹ 1,000 is deposited for two periods at rate of interest 6% per period. In this way, this problem becomes a FV problem with interest rate r = 6% and number of periods n = 2. If the compounding is made 'm' number of times per year, then the FV at the end of 'n' years with rate of interest 'r' p.a. may be expressed are as follows :

$$FV = PV\,(1 + r/m)^{mn} \quad (2.3)$$

In Equation 2.3, it may be noted that (*i*) the exponent has been increased from 'n' to 'm.n' to reflect the increased number of compounding periods, and (*ii*) the interest rate per annum has also been adjusted by dividing 'm', to correspond to the shorter compounding periods. Table 2.1 shows the effect of frequent compounding on the FV ₹ 1,000 at rate of interest 12% p.a.

TABLE 2.1 : EFFECT OF COMPOUNDING ON THE FUTURE VALUE.

Compounding Period	Number of Periods (m)	FV (₹)
Annual	1	1,120.00
Half-Yearly	2	1,123.60
Quarterly	4	1,125.51
Monthly	12	1,126.83
Daily	365	1,127.47

Table 2.1 shows that more frequently the compounding is made, the faster is the growth in the FV. It also shows that the rate of interest is 12% p.a. but effectively it has helped earning an effective rate of 12.36% if compounded half-yearly and at 12.55% if compounded quarterly and so on. The rate of interest 12% p.a. is also known as the normal rate of interest and the rate of interest 12.36% or 12.55% etc. are known as the effective rate of interest.

THE EFFECTIVE RATE OF INTEREST : The effective rate of interest is the annually compounded rate of interest that is equivalent to an annual interest rate compounded more than once per year. The effective rate of interest and the nominal rate of interest are equal whenever they generate the same FV. Mathematically,

$$(1 + r_e) = (1 + r/m)^m \quad (2.4)$$

where, r_e = effective rate of interest,
r = normal rate of interest p.a.
m = Number of compounding periods in a year.

In case, m = 1 *i.e.*, annual compounding, then $r_e = r$ *i.e.*, the effective rate of interest is equal to the nominal rate of interest.

The effective rate of interest is very useful in financial decision making particularly in investment decisions where different optional opportunities have different compounding intervals. The effective rate of interest of various options will help the finance manager in selecting the best alternatives.

For example, a deposit of ₹ 10,000 is made in a bank for a period of 1 year. The bank offers two options : (*i*) to receive

interest at 12% p.a. compounded monthly or (*ii*) to receive interest at 12.25% p.a. compounded half-yearly. Which option should be accepted? In this case, the two options can be evaluated as follows :

Option (i) Rate of interest 12% p.a. compounded monthly.

The effective rate of interest can be calculated with the help of Equation 2.4 as follows :

$$(1 + r_e) = (1 + r/m)^m$$
$$= (1 + .12/12)^{12}$$
$$= 1.1268$$
$$\text{therefore, } r_e = .1268 \text{ OR } 12.68\%.$$

Option (ii) Rate of interest 12.25% p.a. compounded half-yearly.

The effective rate of interest can be calculated with the help of Equation 2.4 as follows :

$$(1 + r_e) = (1 + r/m)^m$$
$$= (1 + .1225/2)^2$$
$$= 1.1263$$
$$\text{therefore, } r_e = .1263 \text{ OR } 12.63\%.$$

In this case, the normal rate of return is higher in option (*ii*) *i.e.*, 12.25% but the effective rate of interest is higher in option (*i*) *i.e.*, 12.68%. Therefore, the depositor should select the option (*i*) *i.e.*, interest at 12% p.a. compounded monthly.

This case illustrates two things : First, that highest quoted rate is not necessarily the best. Second, that more the number of compounding during the year (instead of annual compounding), greater and significant would be the difference between the normal quoted rate and effective rate of interest.

FUTURE VALUE OF A SERIES OF EQUAL CASH FLOWS OR ANNUITY OF CASH FLOWS : Quite often a decision may result in the occurrence of cash flows of the same amount every year for a number of years consecutively, instead of a single cash flow. For example, a deposit of ₹ 1,000 each year is to be made at the end of each of the next 3 years from today. This may be referred to as an annuity of deposit of ₹ 1,000 for 3 years. An annuity is thus, a finite series of equal cash flows made at regular intervals. Calculation of the FV of an annuity can also be presented graphically as in Figure 2.1 (rate of interest 10% compounded annually).

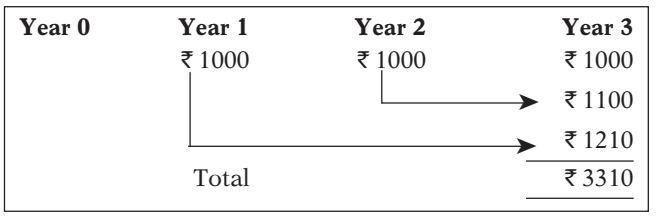

FIG. 2.1: CALCULATION OF FUTURE VALUE OF AN ANNUITY OF 3 YEARS (AT r = 10%)

In this case, each cash flow is to be compounded to find out its FV. The total of these FVs of all these cash flows will be the total FV of the annuity. The FV of an annuity also depends upon three variables *i.e.*, the annual amount, the rate of interest and the time period. In order to find out the FV of an annuity, the pre-calculated mathematical table is available for various combinations of the rate of interest, r, and the time period, n.

This table is given as Table A-2 in Appendix-II. In this table, the value given at the intersection of a particular rate of interest and particular number of years, when multiplied by the amount of annuity gives the FV of the annuity. For example, the FV of an annuity of ₹ 1,000 for 3 years at 10% may be calculated as follows : (*i*) Find out the relevant figure in Table A-2, which is 3.310. (*ii*) Multiply this figure by ₹ 1,000 to give value of ₹ 3,310. This is the FV of the annuity of ₹ 1,000 and it is equal to the value already calculated in Figure 2.1. This factor 3.310 is also known as Compound Value of Annuity Factor for a given combination of 'r' & 'n'. This may be expressed as $CVAF_{(r, n)}$ and Equation 2.1 may be written as Equation 2.1B.

$$FV = \text{Annuity Amount} \times CVAF_{(r, n)} \quad (2.1B)$$
$$= ₹\,1{,}000 \times 3.310$$
$$= ₹\,3{,}310.$$

Mathematically, $CVAF_{(r, n)}$ can be described as equal to $[(1 + r)^t - 1]/r$.

The concept of FV of an annuity can be used in different type of financial decisions. Say, a firm decides to make a deposit of ₹ 10,000 at the end of each of the next 10 years at 10% rate of interest. What will be the total cumulative deposit at the end of 10th year from today? The firm may also be interested to know the total deposit if the rate of interest is 9% or 11%? In this case,

$$\text{Annuity Amount} = ₹\,10{,}000$$
$$n = 10 \text{ years}$$
$$r = 10\%/9\%/11\%$$

On the basis of Table A-2, the following figures can be identified

$$CVAF_{(10\%,10y)} = 15.937$$
$$CVAF_{(9\%,10y)} = 15.193$$
$$CVAF_{(11\%,10y)} = 16.722$$

Therefore, the FV at 10% is 15.937 × ₹ 10,000 = ₹ 1,59,370.
at 9% is 15.193 × ₹ 10,000 = ₹ 1,51,930.
and, at 11% is 16.722 × ₹ 10,000 = ₹ 1,67,220.

Example 2.1

A 4-year annuity of ₹ 3,000 per year is deposited in a bank account that pays 9% interest compounded yearly. The annuity payments begin in year 12 from now. What is the FV of the annuity?

Solution :

The FV of an annuity may be calculated by using Equation 2.1B.

$$FV = \text{Annuity Amount} \times CVAF_{(r, n)}$$
$$\text{where } r = 9\%$$
$$n = 3$$
$$\text{and } CVAF_{(9\%, 3)} = 4.573$$
$$\text{Therefore, FV} = ₹\,3{,}000 \times 4.573$$
$$= ₹\,13{,}719$$

In this example, the fact that the annuity begins in year 12 and ends in year 15 is irrelevant for calculation of the FV because the table values compound over the time period during which

annuity payments are made. Even if, in the same example, the annuity begins in year 20 rather than year 12, its FV would still be ₹ 13,719 unless the other variables are changed.

DISCOUNTING TECHNIQUE

After going through the process of determining the FV of a present money or a present series, now the process of finding out the Present Value (PV) of a future sum or a future series can be discussed. This process is in fact the reverse of compounding technique and is known as the discounting technique. As there are FVs of sums invested now, calculated as per the compounding techniques, there are also the present values of a cash flow scheduled to occur in future. The present value is calculated by discounting technique by applying Equation 2.2 *i.e.*,

$$PV = FV/(1+r)^n \quad (2.2)$$

The discounting technique to find out the PV can be explained in terms of :

(*i*) The PV of a future sum,

(*ii*) The PV of a future series.

PRESENT VALUE OF A FUTURE SUM : The present value of a future sum will be worth less than the future sum because one foregoes the opportunity to invest and thus foregoes the opportunity to earn interest during that period. Expectation of receiving the money in future means that the money is not available presently and, therefore, one has to forego the interest which could be earned, had the money been available now. This also makes a person to loose the opportunities to get reward/return in terms of interest earnings on that investment. This interest foregone is the cost to the investor and the future expected money must be adjusted for this cost. As the length of time for which one has to wait for the future money increases, the cost attached to delay also increases reflecting the compounded value of the lost opportunities. In order to find out the PV of a future money, this opportunity cost of the money is to be deducted from the future money.

Say, ₹ 1,080 is receivable at the end of one year from now and the expected rate of interest which a person can earn on his investment is 8% p.a. then the PV can be calculated with the help of Equation 2.2 as follows :

$$\begin{aligned} PV &= FV/(1+r)^n \\ &= ₹\,1{,}080/(1+.08)^1 \\ &= ₹\,1{,}000 \end{aligned}$$

This means that ₹ 1,080 receivable after 1 year is just equal in worth to ₹ 1,000 receivable today. In the latter case, ₹ 1,000 if received today will earn interest of ₹ 80 (at 8% p.a.) and becomes ₹ 1,080 at the end of 1 year from now. In other words, a person will be indifferent between receiving ₹ 1,000 now or receiving ₹ 1,080 after a year.

It can be seen from Equation 2.2 that the PV of a future money depends upon the three variables *i.e.* the FV, the rate of interest and the time period. There can be an almost infinite combinations of these variables. However, the mathematicians, on the line of compound value tables, have also calculated the values of the factor $1/(1+r)^n$ for different combinations of two variables, 'r' & 'n'. These values are known as Present Values of a future sum for a given rate of interest and time period and is denoted as $PVF_{(r, n)}$. These values have been given in Table A-3 in Appendix-II. The figure given at the intersection of a particular rate of interest, 'r' and time period, 'n', when multiplied by the future amount will give the PV of that amount for the given combination of 'r' & 'n'. Equation 2.2 can now be written as Equation 2.2A *i.e.*,

$$PV = FV \times PVF_{(r, n)} \quad (2.2A)$$

For example, in order to find out the PV of Rs, 1,500 receivable after 3 years and the rate of interest after 10%, the PV factor in Table A-3 (10% column and 3 years row) is .751. Now, ₹ 1,500 × .751 = ₹ 1,126.50 is the PV of ₹ 1,500. It means that an amount of ₹ 1,126.50 invested at 10% p.a. for 3 years will accumulate to ₹ 1,500. Thus, the PV of a future money is the amount that makes a person exactly as well off today as the money received in future.

Two observations can be made on the basis of the values given in the pre-calculated Table A-3 *i.e.*, (*i*) for a given period the higher the interest rate, the lower will be the present value factor and therefore, the lower will be the PV, and (*ii*) for a given rate of interest, the longer the time period the lesser will be the present value factor and therefore, the lower will be the PV. The reason for this behaviour is obvious. As the length of waiting time to receive the future money increases, the discount factor also decreases reflecting the continuation of the lost opportunities to earn interest for a longer period.

THE PV OF A SERIES OF EQUAL FUTURE CASH FLOWS OR ANNUITY : A decision taken today may result in a series of future cash flows of the same amount over a period of number of years. For example, a service agency offers the following options for a 3-year contract: (*i*) Pay only ₹ 2,500 now and no more payment during next 3 years, or (*ii*) Pay ₹ 900 each at the end of first year, second year and third year from now. A client having rate of interest at 10% p.a. can choose an option on the basis of the present values of both options as follows :

Option I : The payment of ₹ 2,500 now is already in terms of the present value and, therefore, do not require any adjustment.

Option II : The customer has to pay an annuity of ₹ 900 for 3 years. This can be presented graphically as in Figure 2.2.

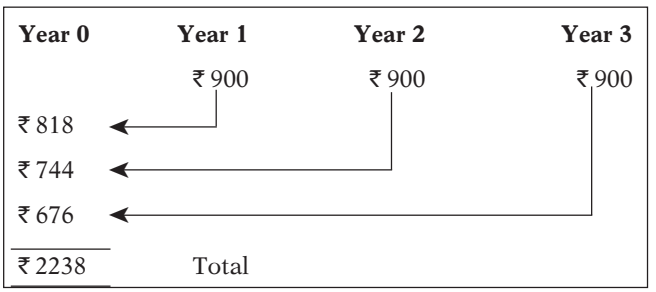

FIGURE 2.2: CALCULATION OF PRESENT VALUE OF AN ANNUITY (at r = 10%).

In order to find out the PV of a series of payment, the PVs of different amounts accruing at different times are to be calculated and then added. For the above example, as shown in Figure 2.2, the total PV is ₹ 2,238. In this case, the client should select the option II, as he is paying a lower amount of ₹ 2,238 in real terms as against ₹ 2,500 payable in option I.

It may be noted that the PV of a future series *i.e.* the annuity also depends upon 3 variables *i.e.*, the annuity amount, the rate of interest and the time period. In order to calculate the PV of an annuity, the pre-calculated mathematical tables are available for different combinations of 'r' and 'n'. These tables are known as Present Value of Annuity Table, and is given as Table A-4 in Appendix-II. In this table, any combinations of 'r' and 'n' will give a value which if multiplied by the annuity amount will give the PV of the annuity for that particular rate of interest and time period. For example, the relevant value for rate of interest 10% and 3 years is 2.487. Now, multiply this value by the annuity amount of ₹ 900. The present value is ₹ 900 × 2.487 = ₹ 2,238. This is the same as found in Figure 2.2.

The values taken from Table A-4 are known as the Present Value of an Annuity Factor for a given combination of 'r' and 'n', and may be denoted as $PVAF_{(r, n)}$. Now, Equation 2.2 can be written as Equation 2.2B *i.e.*,

$$\begin{aligned} PV &= \text{Annuity Amount} \times PVAF_{(r, n)} \qquad (2.2B) \\ &= ₹\ 900 \times 2.487 \\ &= ₹\ 2,238. \end{aligned}$$

Example 2.2

A student is awarded a scholarship and two options are placed before him (*i*) to receive ₹ 1,100 now or (*ii*) receive ₹ 100 p.m. at the end of each of next 12 months. Which option be chosen if the rate of interest is 12% p.a.?

Solution :

Option I : The amount of ₹ 1,100 receivable now is already expressed in the present money and, therefore, does not require any adjustment.

Option II : There is an annuity of ₹ 100 for a period of next 12 months. The rate of interest is 12% p.a. The position can also be expressed as an annuity of 12 periods at rate of interest 1%. On the basis of value given in Table A-4 for $PVAF_{(1\%, 12)}$ which is 11.255, the present value of the annuity is ₹ 100 × 11.255 = ₹ 1,125.50.

Since, the present value in option II is higher than the present value in option I, the student should choose the option II.

In case, the amounts receivable in future are not equal, then the procedure given in the preceding section *i.e.* the PV of a future cash flow is to be adopted. Say, in Example 2.2, the option II is to receive ₹ 500 after 4 months, ₹ 500 at the end of 8th month and ₹ 200 at the end of the year, then the present value of this option II may be calculated with reference to values given in Table A-3. This will be the PV of ₹ 500 (for 4 periods at 1%) + the PV of ₹ 500 (for 8 periods at 1%) + the PV of ₹ 200 (for 12 periods at 1%). That is :

₹ 500	×	.961	=	₹ 480.50
₹ 500	×	.923	=	₹ 461.50
₹ 200	×	.887	=	₹ 177.40
				₹ 1.119.40

So, the present value in option II is ₹ 1,119.40 and therefore, the option II is still better than the option I. It may be noted that the PV of the option II has changed from ₹ 1,125.50 to ₹ 1,119.40 only because of change in the payment schedule.

The discounting techniques to find out the present values is of immense help in financial decision making. This is of much help in the investment decisions and is used frequently in Chapter 4.

On the basis of the above discussion of the future values and the present values, two observations can be made as follows:

(1) That both the FV and the PV are two sides of the same coin. This is evident from the basic Equations 2.1 and 2.2 also *i.e.*,

$$FV = PV(1+r)^n$$

In this situation, either the FV or the PV can be made the dependent variable and can be found by taking the other variable as the independent variable.

(2) For a single cash flow, the future value factor *i.e.* $CVF_{(r, n)}$ will be greater than one, while the present value factor *i.e.* $PVF_{(r, n)}$ will be less than one. The future value is the compounded value and is inclusive of the interest for the interval period. However, the present value is the discounted value and is exclusive of the interest for the interval period.

OTHER SPECIFIC CASH FLOWS

In addition to the types of cash flows discussed above, there are some other types of cash flows also. These are also discounted or compounded to find out their PV or FV respectively. For this, the techniques of discounting or compounding as discussed above can be used with some modifications as follows :

1. **Perpetuity :** A perpetuity may be defined as an infinite Series of equal cash flows occurring at regular intervals. It has indefinitely long life. If a deposit of ₹ 1,000 is made in a savings bank account at 3½% for an indefinite period then the yearly interest of ₹ 35 is a perpetuity of interest income so long as the initial deposit of ₹ 1,000 is kept unchanged. In order to find out the PV of a perpetuity, the present value of each of the infinite number of cash flows should be added. If the first occurrence of the perpetuity takes place after 1 year from today then the present value of the perpetuity may be calculated with the help of the following Equation (given the rate of interest, r) as follows :

$$PV = \frac{\text{Cash Flow}}{(1+r)^1} + \frac{\text{Cash Flow}}{(1+r)^2} + \ldots\ldots\ldots\ldots + \frac{\text{Cash Flow}}{(1+r)^{\infty}} \qquad (2.5)$$

Conceptually, it is difficult or rather impossible to find out the PV of a perpetuity. However, mathematically it is the easiest stream of the cash flows to value. Mathematically, infinite summation adds up to the simple version given in equation 2.5A.

$$PV_p = \text{Annual Cash flow}/r \qquad (2.5A)$$

where PV_p is the present value of a perpetuity. Thus, the present value of a perpetuity is equal to the amount of perpetuity divided by the rate of interest. The concept of perpetuity valuation has many applications in financial decision making. Some of these are :

Example 2.3

Find out the present value of an investment which is expected to give a return of ₹ 2,500 p.a. indefinitely and the rate of interest is 12% p.a.

Solution :

Using the Equation 2.5A,

$$PV_p = \text{Annual Cash flow}/r$$
$$= ₹\ 2,500/.12 = ₹\ 20,833.33$$

Example 2.4

A finance company makes an offer to deposit a sum of ₹ 1,100 and then receive a return of ₹ 80 p.a. perpetually. Should this offer be accepted if the rate of interest is 8%? Will the decision change if the rate of interest is 5%?

Solution :

In this case, a person should accept the offer only if the PV of the perpetuity is more than the initial deposit of ₹ 1,100.

If the rate of interest is 8%, then using the Equation 2.5A,

$$PV_p = \text{Annual Cash flow}/r$$
$$= ₹\ 80/.08 = ₹\ 1,000.$$

If the rate of interest is 5%, then

$$PV_p = \text{Annual Cash flow}/r$$
$$= ₹\ 80/.05 = ₹\ 1,600.$$

The offer need not be accepted at 8% rate of interest because the PV of the perpetuity is only ₹ 1,000. It means that the depositor has to pay ₹ 1,100 today and will be receiving only ₹ 1,000 in real terms. However, if the rate of interest reduces to 5% p.a. then the offer is acceptable as the PV of the perpetuity now is ₹ 1,600 and the depositor will be benefited by ₹ 500 in the long run.

In addition to specified perpetuities, long term annuities can also be treated as perpetuities in order to obtain a good approximation of the PV. The advantage of using perpetuities as approximation to annuity value is that the present value tables are not required and the PV of a fairly long period annuity can be easily calculated.

2. **Annuity Due :** The discussion on FV or the PV of an annuity was based on the presumption that the cash flows occur at the end of each of the periods starting from now. However, in practice the cashflow may also occur in the beginning of each period. Such a situation is known as annuity due.

In an ordinary annuity of n years, the first cashflow will occur after 1 year from now and the last cashflow will occur at the end of the nth period. On the other hand, in annuity due, the first cashflow occurs now and the last cashflow will occur in the beginning of the nth year *i.e.* at time n – 1. So, both types of annuities have 'n' cash flows. However, the valuation methods are different. The valuation of an annuity due can be explained as follows :

FV of an Annuity Due : The FV of an annuity is given by the formula :

$$FV = \text{Annuity Amount} \times CVAF_{(r,n)} \times (1 + r) \qquad (2.6)$$

For example, a recurring deposit of ₹ 100 is made in the beginning of each of 4 years starting now at 6% p.a. What will be the total deposit at the end of 4 years? This can be calculated as follows :

$$FV = \text{Annuity Amount} \times CVAF_{(r,n)} \times (1 + r)$$
$$= ₹\ 100\ (4.375)\ (1 + .06)$$
$$= ₹\ 463.75.$$

PV of an Annuity Due : The present value of an annuity due is given by the formula :

$$PV = \text{Annuity Amount} \times PVAF_{(r,n)} \times (1 + r) \qquad (2.7)$$

For example, if ₹ 1,000 is receivable in the beginning of next 4 years starting from now and the rate of interest is 6% then the PV may be calculated as follows :

$$PV = \text{Annuity Amount} \times PVAF_{(r,n)} \times (1 + r)$$
$$= ₹\ 1,000\ (3.465)\ (1 + .06)$$
$$= ₹\ 3,673.$$

3. **Growing Perpetuity :** A growing perpetuity may be defined as an infinite series of periodic cash flows which grow at a constant rate per period. For example, an amount is receivable indefinitely in such a way that the amount of a particular period is 10% more than the amount for the preceding period. The summation of infinite series of ever increasing cash flows at the rate of growth, g, can be calculated as follows :

$$PV = \text{Cash flow}_1/(r - g) \qquad (2.8)$$

where cash flow_1 = The cash flow at the end of the first period,
r = rate of interest,
and, g = growth rate in perpetuity amount.

However, it may be noted that above formula can be used only if the rate of interest is more than the rate of growth *i.e.* $r > g$. For example, a company is expected to declare a dividend of ₹ 2 at the end of first year from now and this dividend is expected to grow 10% every year. What is the PV of this stream of dividend if the rate of interest is 15%? The PV for this dividend stream can be calculated as follows :

$$PV = \text{Cashflow}_1/(r - g)$$
$$= ₹\ 2/(.15–.10)$$
$$= ₹\ 40.$$

4. **Growing Annuity :** A growing annuity may be defined as a finite series of periodic cash flows growing at a constant rate every period. Since, an annuity is nothing but a truncated growing perpetuity, the growing annuity can also be viewed as a truncated growing perpetuity. Thus, the valuation of growing annuity is akin to the valuation of growing perpetuity. Mathematically, the valuation of a glowing annuity can be arrived at as follows :

$$PV = \frac{CF_1}{r-g}\left[1\left(\frac{1+g}{1+r}\right)^n\right] \quad (2.9)$$

where, CF_1 = Cashflow at the end of the period 1,
r = Rate of interest,
g = Growth rate, and
n = Life of annuity

However, the above formula cannot be used if r = g because in this case, $CF_1/r - g$ becomes $CF_1/0$ which is not allowed. If r = g, then the PV of a growing annuity is calculated as follows :

$$PV = CF_1 \times n/(1 + r) \quad (2.9A)$$

For example, a person opens a recurring deposit account for a period of 10 years earning 12% interest and accepts the scheme under the condition that for the first year the deposit is ₹ 3,150 and for subsequent years the deposit amount will increase by 5% every year. What is the PV of this scheme? The present value of this scheme of deposit may be ascertained by using Equation 2.9 as follows :

$$PV = \frac{CF_1}{r-g}\left[1\left(\frac{1+g}{1+r}\right)^n\right]$$

$$= \frac{₹\ 3150}{.12-.05}\left[1\left(\frac{1+.05}{1+.12}\right)^{10}\right]$$

$$= ₹\ 45{,}000\ [1 - (.937)^{10}]$$

$$= ₹\ 45{,}000(.478) = ₹\ 21{,}510.$$

However, if the rate of interest is only 5% *i.e.*, equal to the growth rate, g, then the present value may be calculated by using Equation 2.9A as follows :

$$PV = CF_1 \times n/(1 + r)$$

$$= ₹\ 3{,}150 \times 10/(1 + .05) = ₹\ 30{,}000.$$

APPLICATIONS OF THE CONCEPT OF TVM

Sometimes, the finance manager has to deal with varying situations of decision making where the concept of TVM needs to be applied in one form or the other. However, it may be noted that the proper understanding of the cash flows, selection of an appropriate discounting/compounding technique and applying the technique correctly are some of the prerequisites of an appropriate decision based on TVM. Practice and experience, both are required for the proper use of the techniques of TVM. The following are some of the applications of the concept of the TVM.

1. **Finding out the Implicit Rate of Interest :** Several financial institutions have issued the Deep Discount Bonds (DDB) where the investor is required to pay a specific amount per bond at the time of issue and receives a much larger amount at the end of a specified period. The rate of interest however, is not given. The technique of TVM can be applied to find out the implicit rate of interest as applicable to DDBs.

For example, a DDB is issued for ₹ 5,000 today and will mature after 6 years for ₹ 20,000. The implicit rate of interest can be ascertained with the help of Equation 2.1.

$$FV = PV \times (1 + r)^6$$

This equation can be used to derive the value of 'r' as follows :

$$FV = PV \times CVF_{(r,6)}$$

$$20{,}000 = 5000 \times CVF_{(r,6)}$$

$$4 = CVF_{(r,6)}$$

In the CVF Table, the value 4 may be found in the 26% Column for 6 years period. So, the implicit rate of interest is 26%.

A finance company may offer a scheme under which an investor may be required to deposit a specific amount now and to receive a series of returns for a specific number of years. The scheme may be acceptable to an investor only if the implicit rate of interest is more than the normal rate of interest. For example, a company offers a scheme under which a deposit of ₹ 15,000 now will entitle the depositor to receive ₹ 4,000 per year at the end of each of next 5 years. Should the scheme be accepted or not?

This decision can be taken on the basis of Equation 2.2B

$$PV = \text{Annuity Amount} \times PVAF_{(r,n)}$$

$$\text{or } PVAF_{(r,n)} = PV/\text{Annuity Amount}$$

$$PVAF_{(r,5)} = ₹\ 15{,}000/₹\ 4{,}000 = 3.75$$

The value of 'r' now can be found by searching for a value of 3.75 or its closest value in the row of 5 years in Table A-4. The closest values found are 3.790 in 10% column and 3.696 in 11% column. By interpolating between 10% and 11%, the value of 'r' comes to 10.57%. So, the scheme has an implicit rate of interest of 10.57%. The investor may opt for the scheme if the normal rate of interest for him is less than this.

Example 2.5

In setting up an educational fund, a person agrees to make five annual payments of ₹ 5,000 each into a 'college fund programme'. The first payment is to be made 12 years from now and the 'college fund programme' wishes that upon making the last payment, the amount available should have grown to ₹ 30,000. What should be the minimum rate of return on this fund?

Solution :

In this case, the amount of ₹ 30,000 can be considered as the future value of the annuity of ₹ 5,000. Consider the Equation 2.1B to find out the future value of the annuity :

$$FV = \text{Annuity Amount} \times CVAF_{(r,n)}$$

$$₹\ 30{,}000 = ₹\ 5{,}000 \times CVAF_{(r,n)}$$

$$6 = CVAF_{(r,n)}$$

Now, looking at the 5-year row in Table A-2, the value 6 falls between the table value of 5.985 and 6.105 in the 9% column and 10% column respectively. Hence, the rate of return on this annuity is slightly higher than 9%. So, the college fund programme must earn a rate of return of slightly higher than 9% on the annual deposit to accumulate a target amount of ₹ 30,000. In this case, the fact that the annuity starts from 12 years from now is irrelevant in computing the interest rate because the annuity table compounds only during the interval period over which the annuity payments are being made.

2. **Finding out the Number of periods :** Sometimes, one may be interested to find out the time over which a certain amount

will grow at a given rate of interest to a certain value. In this case, the value of 'n', can be ascertained by solving Equation 2.1.

Example 2.6

₹ 1,000 is deposited into an interest-bearing account that pays 10% interest compounded yearly. The investor's goal is ₹ 1,500. How many years must the principal earn compound interest before the desired amount is realized?

Solution :

This situation can be visualized as to what is the time period over which the amount of ₹ 1,000 will cumulate to ₹ 1,500 at 10% rate of interest.

Substituting the values into Equation 2.1,

$$\begin{aligned} FV &= PV(1+r)^n \\ ₹\,1,500 &= ₹\,1,000\,(1+10)^n \\ ₹\,1,500/₹1,000 &= (1+.10)^n \\ 1.5 &= (1+.10)^n \end{aligned}$$

Now, look up the 10% column in Table A-1 and read vertically until a value that equals or approximates the computed value of 1.5 is found. This is 1.611, which corresponds to 5 years. If ₹ 1,000 principal is left at 10% interest for 5 years, the resulting compound amount will be ₹ 1,611. This exceeds the desired ₹ 1,500. If the same principal was left at 10% interest for only 4 years, the compound amount available will be only ₹ 1,464. The investor should leave the deposit for the entire fifth year because of the assumption of compounding only at the end of each year, and he will then receive an amount of ₹ 1,611.

Example 2.7

A loan of ₹ 50,000 is to be repaid in equal annual instalments of ₹ 14,000. The loan carries a 6% interest rate. How many payments are required to repay this loan?

Solution :

As a first step, it must be made sure that the first year's interest is less than ₹ 14,000. Since 6% of ₹ 50,000 is only ₹ 3,000, the payment at year 1 ₹ 14,000 will provide some repayment of principal also. Now substitute the data values into Equation 2.1B,

$$\begin{aligned} PV &= \text{Annuity Amount} \times PVAF_{(r,n)} \\ ₹\,50,000 &= ₹\,14,000 \times PVAF_{(r,n)} \\ PVAF_{(r,n)} &= ₹\,50,000 \div 14,000 = 3.571 \end{aligned}$$

Now, look at the 6% column in Table A-4 and read down until a table value approximates the computed value of 3.571. The desired table value is 4.212, and this corresponds to 5 payments. However, because the computed value of 3.571 is less than the table value of 4.212, the loan payment schedule does not require the fifth payment to be as large as ₹ 14,000. This is demonstrated in Table 2.2, which is the year-by-year payment schedule for this loan.

TABLE 2.2 : PAYMENT SCHEDULE OF ₹ 50,000 LOAN, FIVE PAYMENT AT 6%

Year	Principal Owed	Interest	Total	Yearly Payment	Payment of Interest	Payment of Principal
1	50,000	3,000	53,000	14,000	3,000	11,000
2	39,000	2,340	41,340	14,000	2,340	11,660
3	27,340	1,640	28,980	14,000	1,640	12,360
4	14,980	899	15,879	14,000	899	13,101
5	1,879	113	1,992	1,992	113	1,879
	Total			57,992	7,992	50,000

So, the person has to make four instalments of ₹ 14,000 each and the last instalment will be only ₹ 1,992 comprising of interest of ₹ 113 and principal repayment of ₹ 1,879.

3. **Sinking Funds :** Quite often, one may be interested to accumulate a target amount over a given period inclusive of interest for the period in such a way that the annual amount being subscribed over the period is same for all years. In case of a business firm, a finance manager may be interested to accumulate a target amount in order to replace an asset or in order to repay a liability at the end of a specified period. In this case, the annual accumulation by the finance manager in fact becomes the annuity for a given period where each of the annual subscription/accumulation will be invested for the remaining period so that the total accumulation at the end of the given period is equal to the target amount. For example, an amount of ₹ 1,00,000 is required at the end of 5 years from now to repay a debenture liability. What amount should be accumulated every year at 10% rate of interest so that it ultimately becomes ₹ 1,00,000 after 5 years? This can be ascertained by finding out the value of 'Annuity Amount' in Equation 2.1B.

$$\begin{aligned} FV &= \text{Annuity Amount} \times CVAF_{(r,n)} \\ \text{or, Annuity Amount} &= FV/CVAF_{(r,n)} \qquad (2.10) \end{aligned}$$

From the Table A-2, the value of $CVAF_{(10\%,5y)}$ is 6.105. Therefore, Annuity Amount= ₹ 1,00,000/6.105 = ₹ 16,380.

Therefore, an amount of ₹ 16,380 should be accumulated and invested at 10% rate of interest. This will accumulate to a total of ₹ 1,00,000 by the end of 5 years.

It may be noted that the factor $1/CVAF_{(r,n)}$ is also known as the ***Sinking Fund Value factor.***

Example 2.8

A machine costs ₹ 98,000 and its effective life is estimated at 12 years. If the scrap value is ₹ 3,000, what should be retained out of profit at the end of each year to accumulate at compound interest rate at 5% p.a., so that a new machine can be purchased after 12 years?

Solution :

$$\begin{aligned} \text{Effective cost of the machine} &= ₹\,98,000 - 3,000 = ₹\,95,000. \\ \text{Now FV} &= \text{Annuity Amount} \times CVAF_{(5\%,\,12y)} \\ \text{or } ₹\,95,000 &= \text{Annuity Amount} \times 15.917 \\ \text{or Annuity Amount} &= ₹\,95,000 \div 15.917 \\ &= ₹\,5,968 \end{aligned}$$

So, annual profit retained of ₹ 5,968 for 12 years @ 5% will accumulate to ₹ 95,000 which together with scrap value of ₹ 3000 can be used to purchase the new machine.

4. **Capital Recovery :** Sometimes, one may be interested to find out the equal annual amount paid in order to redeem a loan of a specified amount over a specified period together with the interest at a given rate for that period. For example, ₹ 1,00,000 borrowed today is to be repaid in five equal instalments payable at the end of each of next 5 years in such a way that the interest at 10% p.a. for the intervening period is also repaid. The annuity amount in this case can be ascertained from the Equation 2.2B as follows :

$$PV = \text{Annuity Amount} \times PVAF_{(r,n)}$$

or, $$\text{Annuity Amount} = PV/PVAF_{(r,n)}$$

From the Table A-4, the value of $PVAF_{(10\%,5y)}$ is 3.791. Therefore, Annuity Amount = ₹ 1,00,000/3.791 = ₹ 26,378.

So, the amount of ₹ 26,378 if paid at the end of each next 5 years then the initial loan of ₹ 1,00,000 together with interest at 10% will be repaid.

It may be noted that the factor $1/(PVAF_{r,n})$ is also known as the ***Capital Recovery Factor.***

5. **Deferred Payments :** Suppose a person takes a loan of a specified amount at a given rate of interest. He wants to repay this loan together with interest in such a way that the annual amount being paid is same and further that the first payment be made a few years from now. In this case, the interest for the period for which the payment has been delayed (*i.e.* the period from the date of loan to the date of first payment) should also be considered in finding out the annual payment for the repayment of loan together with the interest. For example, a loan of ₹ 1,00,000 is taken on which interest is payable @ 10%. However, the repayment is to start only at the end of third year from now. What should be the annual payment if the total loan and interest is to be repaid in six instalments ? The situation can be graphically presented as in Figure 2.3

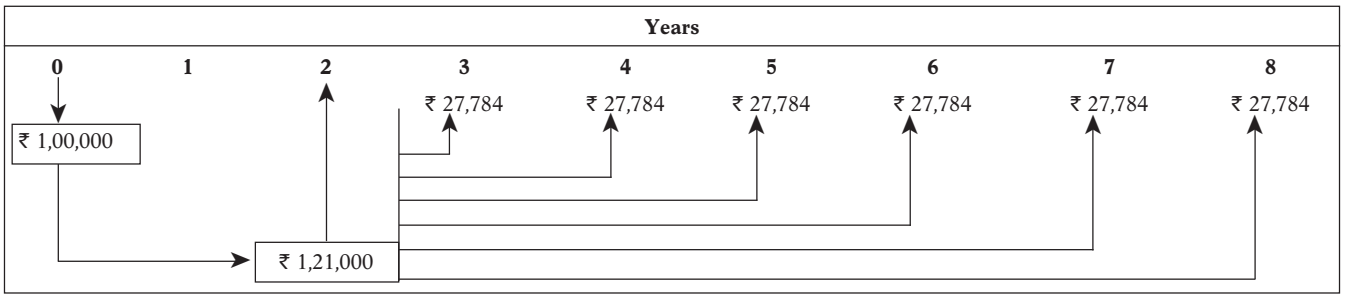

FIGURE 2.3 : CALCULATION OF ANNUAL PAYMENTS (DELAYED) AT r = 10%.

In order to find out the annual repayment amount starting from the end of third year from now, the following procedure may be adopted :

Step 1. Find out the total amount due at the end of 2nd year *i.e.* in the beginning of the 3rd year from now at 10%. This can be ascertained with the help of Equation 2.1 *i.e.*,

$$FV = PV(1 + r)^n$$
$$= ₹\ 1,00,000\ (1 + .10)^2 = ₹\ 1,21,000.$$

Step 2. Now, ₹ 1,21,000 is the PV of the annuity of 6 year period at 10% interest. The annuity amount can be ascertained with the help of Equation 2.2B as follows :

$$PV = \text{Annuity Amount} \times PVAF_{(r,n)}$$
$$₹\ 1,21,000 = \text{Annuity Amount} \times PVAF_{(10\%,6)}$$
$$= \text{Annuity Amount (4.355).}$$

Therefore, Annuity Amount = ₹ 1,21,000/4.355 = ₹ 27,784

Thus, the amount of ₹ 27,784 payable every year for 6 years starting from the 3rd year will repay not only the loan of ₹ 1,00,000 but also the total interest for 8 years (*i.e.* delayed period of 3 years and 6-year annuity period).

POINTS TO REMEMBER

- Time Value of Money is one of the fundamental concepts of financial management.
- The cash inflows and outflows relating to any decision do not occur at the same point of time and hence are not comparable. The interest factor in terms of Time Value of Money makes them comparable.
- Individuals as well as business firms have preference for present money because future money involves future uncertainties. There is always a preference for present consumption. The present money can be invested to earn some interest.
- Monetary cash flows occurring at different point of time can be made comparable by introducing the concept of TUM.
- There are two techniques of incorporation of time value of money. These are Compounding and Discounting. The former deals with the future value of a present money while the latter deals with the present value of a future money.
- The basic equations for time value of money can be presented as :

$$FV = PV\ (1 + r)^n$$

and, $$PV = FV/(1 + r)^n$$

- The concept of time value of money can be applied to a particular amount, or a series of amounts, or a perpetuity.
- It can be used to find out the implicit rate of interest, number of period of cash inflows or problems relating to sinking funds or capital recovery.

GRADED ILLUSTRATIONS

Illustration 2.1

Assume that a deposit is to be made at year zero into an account that will earn 8% compounded annually. It is desired to withdraw ₹ 5,000 three years from now and ₹ 7,000 six years from now. What is the size of the year zero deposit that will produce these future payments?

Solution :

Let the initial deposit be sum of the present values of the two later withdrawals by using the present value table.

$$PV = FV \times PVF_{(r,n)}$$
$$PV = ₹\,5,000 \times PVF_{(8\%,3)} + ₹\,7,000 \times PVF_{(8\%,6)}$$
$$PV = ₹\,5,000(.794) + ₹\,7,000(.630)$$
$$PV = ₹\,3,970 + ₹\,4,410 = ₹\,8,380.$$

The amount of ₹ 8,380 grows to a value of ₹ 10,559 in three years; ₹ 5,000 is withdrawn then, leaving ₹ 5,559. This amount is left for another three years to compound to the desired amount of ₹ 7,000. Therefore, an amount of ₹8,380 deposited today will result in the desired withdrawals.

Illustration 2.2

Assume that a ₹ 20,00,000 plant expansion is to be financed as follows : The firm makes a 15% down payment and borrows the remainder at 9% interest rate. The loan is to be repaid in 8 equal annual instalments beginning 4 years from now. What is the size of the required annual loan payments?

Solution :

The firm borrows ₹ 17,00,000 (85%). Compound interest occurs over the entire 11 years of the life of the loan. In order to obtain the required annual loan payment, two additional points have to be remembered : (1) the loan repayment will be computed by using a present-value annuity table; and (2) the present value of an annuity located one year before the first payment.

To compute the size of the annual payment, first compute the amount owed at the end of year 3 (one year before the first payment). By compounding ₹ 17,00,000 for three years at 9%,

$$FV = PV(1 + r)^n$$
$$FV = ₹\,17,00,000\,(1 + .09)^3$$
$$FV = ₹\,22,01,550$$

Now the FV becomes the present value of the 8-payment annuity discounted at 9%. So, compute the equal yearly payment by using Equation 2.2B.

$$PV = \text{Annuity Amount} \times PVAF_{(r,n)}$$
$$PV = \text{Annuity Amount} \times PVAF_{(9\%,8)}$$
$$₹\,22,01,500 = \text{Annuity Amount} \times (5.535)$$
$$\text{Annuity Amount} = ₹\,3,97,750.$$

The plant expansion financing plan can be summarized as follows : Down payment at year zero of ₹ 3,00,000; the balance borrowed at 9% interest. Eight yearly loan repayments of ₹ 3,97,750 are to be made beginning at the end of year 4.

Illustration 2.3

A potential investor is considering the purchase of a bond that has the following characteristics : the bond pays 8% per year on its ₹ 1,000 principal, or face value. The bond will mature in 20 years. At maturity, the bondholder will receive interest for year 20 *plus* ₹ 1,000 face value. What is the maximum purchase price that should be paid for this bond if the investor requires a 10% rate of return?

Solution :

Assume that if the bond is purchased now, the first interest payment will be received in one year and that the bond will mature 20 years from now. The yearly interest payment will be ₹ 80 (8% of ₹ 1,000). In year 20 a payment of ₹ 1,080 will be received (₹ 1,000 + ₹ 80).

The maximum purchase price for this bond is the sum of the present value of the future inflows discounted at the 10% required rate of return. The interest payments are treated as an annuity; the ₹ 1,000 principal is discounted as a single payment. The present value of the interest payments is found by discounting for 20 payments and 10% interest.

$$PV = \text{Annuity Amount} \times PVAF_{(r,n)}$$
$$PV = ₹\,80 \times PVAF_{(10\%,20)}$$
$$PV = 80(8.514) = ₹\,681.12$$

Now, the present value of ₹ 1,000 receivable at the end of year 20 can be found by discounting for 20 years at 10% interest.

$$PV = FV \times PVF_{(r,n)}$$
$$PV = FV \times PVF_{(10\%,20)}$$
$$PV = 1,000(.149) = ₹\,149$$

The maximum purchase price is thus ₹ 681.12 + ₹ 149.00 = ₹ 830.12

Illustration 2.4

A 10-year savings annuity of ₹ 2,000 per year is beginning at the end of current year. The payment of retirement annuity is to begin 16 years from now (the first payment is to be received at the end of year 16) and will continue to provide a 20-year payment annuity. If this plan is arranged through a savings bank that pays interest @ 7% per year on the deposited funds, what is the size of the yearly retirement annuity that will result ?

Solution :

Obtain the compounded amount of the 10-payment savings annuity of ₹ 2,000 corresponding to 10 payments and 7%.

$$\begin{aligned} FV &= \text{Annuity Amount} \times CVAF_{(r,n)} \\ FV &= ₹\,2{,}000 \times CVAF_{(7\%,10)} \\ FV &= 2{,}000(13.816) = ₹\,27{,}632 \end{aligned}$$

The amount of ₹ 27,632 is available immediately after the last payment. Now, compound the amount of ₹ 27,632 for 5 years as a single payment at 7%. This will give the total cumulative value in the beginning of year 16.

$$\begin{aligned} FV &= PV \times CVF_{(r,n)} \\ FV &= PV \times CVF_{(7\%,5)} \\ FV &= 27{,}632(1.403) = ₹\,38{,}768. \end{aligned}$$

Finally, obtain the size of the equal retirement annuity payment by using the amount of ₹ 38,768 as the present value of the retirement annuity. Substitute the values corresponding to 20-payments and 7% as follows :

$$\begin{aligned} PV &= \text{Annuity Amount} \times PVAF_{(r,n)} \\ PV &= \text{Annuity Amount} \times PVAF_{(7\%,20)} \\ ₹\,38{,}768 &= \text{Annuity Amount}\ (10.594) \\ \text{Annuity Amount} &= ₹\,3{,}659. \end{aligned}$$

Thus, the savings annuity of ₹ 2,000 for 10 years will produce 20 years retirement annuity of ₹ 3,659 per year starting at the end of 16 years from now.

Illustration 2.5

A company offers to refund an amount of ₹ 44,650 at the end of 5 years for a deposit of ₹ 6,000 made annually. Find out the implicit rate of interest offered by the company.

Solution :

In this case, the refund amount of ₹ 44,650 is the future amount of annuity of ₹ 6000 after 5 years at a particular rate of interest. This can be presented like this :

$$\begin{aligned} ₹\,44{,}650 &= 6{,}000 \times CVAF_{(r,5y)} \\ CVAF_{(r,5y)} &= 44{,}650 \div 6{,}000 = 7.442 \end{aligned}$$

Now in the CVAF table, the value 7.442 corresponding to 5 years row is found in 20% column. So, the implicit rate of interest is 20%.

Illustration 2.6

An investor deposits a sum of ₹ 1,00,000 in a bank account on which interest is credited @ 10% p.a. How much amount can be withdrawn annually for a period of 15 years?

Solution :

In this case, the deposit of ₹ 1,00,000 can be viewed as the present value of the future annuity of 15 years @ 10%. The situation can also be presented as follows:

$$\begin{aligned} ₹\,1{,}00{,}000 &= \text{Annuity Amount} \times PVAF_{(10\%\ 15y)} \\ &= \text{Annuity Amount} \times 7.606 \\ \text{Annuity Amount} &= 1{,}00{,}000 \div 7.606 = ₹\,13{,}148 \end{aligned}$$

So the investor can withdraw an annuity of ₹ 13,148 for 15 years.

Illustration 2.7

What is the minimum amount which a person should be ready to accept today from a debtor who otherwise has to pay a sum of ₹ 5,000 to day ₹ 6,000, ₹ 8,000, ₹9,000 and ₹ 10,000 at the end of year 1, 2, 3, 4 respectively from today. The rate of interest may be taken at 14%.

Solution :

The minimum amount in this case is the PV of the series of amount due discounted at 14%, as follows :

Year	Amount due	$PVF_{(14\%,n)}$	PV(₹)
0	₹ 5,000	1,000	5,000
1	6,000	.877	5,262
2	8,000	.769	6,152
3	9,000	.675	6,075
4	10,000	.592	5,920
			₹28,409

The minimum acceptable amount is ₹ 28,409.

Illustration 2.8

A company is offered a contract which has the following terms : An immediate cash outlay of ₹ 15,000 followed by a cash inflow of ₹ 17,900 after 3 years. What is the company's rate of return on this contract?

Solution :

The amount of ₹ 15,000 cash outflow may be treated as a principal which the company deposits into an account that pays an unknown rate of interest but returns a compounded amount of ₹ 17,900 after 3 years. These values may be substituted in Equation 2.1.

$$\begin{aligned} FV &= PV(1+r)^n \\ ₹\,17{,}900 &= ₹\,15{,}000\,(1+r)^3 \\ ₹\,17{,}900/₹\,15{,}000 &= (1+r)^3 \\ 1.193 &= (1+r)^3 \end{aligned}$$

In the compound value Table A-1, value closest to the value of 1.193 in the 3 years row is found in 6% interest rate. Thus, the actual rate of interest on the contract is slightly greater than 6%.

OBJECTIVE TYPE QUESTIONS

State whether each of the following statements is ***True (T)*** *or* ***False (F)****.*

(*i*) Money has no time value

(*ii*) Investors do not have preference for present money

(*iii*) Interest factor helps in incorporating the time value of money in financial analysis.

(*iv*) Time value of money is invariably considered in financial decision making.

(*v*) Compounding and discounting techniques are same.

(*vi*) Cash flows occurring at different point of time are comparable in absolute terms.

(*vii*) The present value of a future amount remains same irrespective of the time of occurrence.

(*viii*) Present values and future values can be calculated only with the help of relevant mathematical tables.

(*ix*) The discounting techniques help in finding out the future value of a present amount.

(*x*) $PVF_{(r,n)}$ and $PVAF_{(r,n)}$ are same.

(*xi*) Implicit rate of interest can be found with the help of compounding technique.

(*xii*) An annuity is an infinite series of cash flows.

(*xiii*) The number of cashflows in a perpetuity is known.

(*xiv*) "A bird in hand is worth two in the bush" correctly presents the concept of time value of money.

(*xv*) Rate of interest and time period, both are required to find out the present/future value.

[**Answers :** *(i) F, (ii) F, (iii) T, (iv) F, (v) F, (vi) F, (vii) F, (viii) F, (ix) F, (x) F, (xi) T, (xii) F, (xiii) F, (xiv) T, (xv) T.*]

MULTIPLE CHOICE QUESTIONS

1. Discounting technique is used to find out :
   (*a*) Terminal Value
   (*b*) Compounded Value
   (*c*) Present Value
   (*d*) Future Value.

2. The adjustment for time value of money is made through :
   (*a*) Interest Rate
   (*b*) Inflation Rate
   (*c*) Growth Rate
   (*d*) None of the above.

3. Equal Annual Cash Flows occurring at the end of each year for certain period are known as :
   (*a*) Annuity
   (*b*) Perpetuity
   (*c*) Annuity Due
   (*d*) Deferred Payments.

4. Equal annual amounts occurring in the beginning of certain years are known as :
   (*a*) Annuity
   (*b*) Perpetuity
   (*c*) Annuity Due
   (*d*) Deferred Payments.

5. Present Value of a future cash flow would decrease if :
   (*a*) Discount Rate is reduced
   (*b*) Discount Rate is increased
   (*c*) Time Period is decreased
   (*d*) All of the above.

6. Future cash flows are converted to present values, so that these can be :
   (*a*) Aggregated
   (*b*) Compared
   (*c*) Used in Decision-making
   (*d*) All of the above.

7. 'Rule of 72' is a short-cut method to estimate the :
   (*a*) Present Values
   (*b*) Compounding Effect
   (*c*) Both (*a*) & (*b*)
   (*d*) None of the above.

8. Effective Interest Rate is a factor of :
   (*a*) Compounding Frequency
   (*b*) Basic Rate of Interest
   (*c*) Both (*a*) and (*b*)
   (*d*) None of the above.

9. A series of Constant Cash flows occurring at regular intervals forever is known as :
   (*a*) Growing Annuity
   (*b*) Perpetuity
   (*c*) Growing Perpetuity
   (*d*) Annuity

10. Future Value and Present Value, both are based on :
   (*a*) Number of Time periods
   (*b*) Interest Rate
   (*c*) Both (*a*) and (*b*)
   (*d*) None of the above.

11. If the Interest Rate is greater than zero, which of the following series you would prefer to receive :

	Year 1	Year 2	Year 3	Year 4
(*a*)	₹ 500	₹ 400	₹ 300	₹ 200
(*b*)	₹ 200	₹ 300	₹ 400	₹ 500
(*c*)	₹ 350	₹ 350	₹ 350	₹ 350

(*d*) Any of the above as all are equal in total amount.

12. Time Value of Money is an important concept in finance because it takes into account :

(*a*) Risk

(*b*) Time

(*c*) Compound Interest

(*d*) All of the above.

13. Which of the following is called an annuity :

(*a*) Lump Sum after few years

(*b*) A Series of Equal and Regular Amounts

(*c*) A Series of Unequal Amounts

(*d*) A Series of Equal and Irregular Amounts.

14. An investor wants to increase the Present Value. The rate of discount applied for should be :

(*a*) Increased

(*b*) Decreased

(*c*) Any of (*a*) and (*b*)

(*d*) None of the above.

15. If $n = 1$ and Rate of interest > zero, which of the following interest factor is equal to one :

(*a*) Present Value Factor

(*b*) Compound Value Factor

(*c*) Present Value Annuity Factor

(*d*) None of the above.

16. If Time is '*n*', Rate of Interest is '*k*' then $(1 + k)^n$ may be called :

(*a*) Present Value Factor

(*b*) Compound Value Factor

(*c*) Compound Value Annuity Factor

(*d*) None of the above.

17. In a Loan Repayment Schedule, the interest amount paid each period :

(*a*) Remained Constant

(*b*) Increases

(*c*) Decreases

(*d*) None of the above.

18. Future Value of an annuity is :

(*a*) Equal to Annuity Amount

(*b*) Less than Annuity Amount

(*c*) More than total of Annuity Amount

(*d*) None of the above.

19. Concept of Future Value and Present Value are :

(*a*) Proportionately related

(*b*) Inversely related

(*c*) Directly related

(*d*) Not related

20. If a student is awarded scholarship receivable over next 12 months, what calculation he should use to find out the worth of scholarship today?

(*a*) Present Value of an Amount

(*b*) Future Value of an Amount

(*c*) Present Value of an Annuity

(*d*) Future Value of an Annuity

21. A student deposits some amount daily to accumulate ₹ 5,000 to pay his tuition fees after one year. Which of the following compounding methods of interest should be opted by him :

(*a*) Compounded Quarterly

(*b*) Compounded Daily

(*c*) Compounded Half-yearly

(*d*) Compounded Annually.

22. Which of the following is the highest value?

(*a*) Present Value of ₹ 1,000 receivable after one year

(*b*) Total Value of ₹ 1,000 deposited in Savings Bank A/c for one year

(*c*) ₹ 1,001

(*d*) ₹ 1,000 deposited in Fixed Deposit @ 5.50% for one year.

23. Present Value can be calculated with the help of formula :

(*a*) $(1 + r)^n$

(*b*) $1/(1 + r)^n$

(*c*) $(1 + r)^n/1$

(*d*) None of the above.

24. Present Value of a Rupee receivable after one year is :

(*a*) More than One Rupee

(*b*) Less than One Rupee

(*c*) Equal to One Rupee

(*d*) Equal to Future Value.

25. Future Value of One Rupee invested today is :

(*a*) More than One Rupee

(*b*) Equal to One Rupee

(*c*) Equal to Present Value

(*d*) Less than One Rupee.

[**Answers :** *1. (c), 2. (a), 3. (a), 4. (c), 5. (b), 6. (d), 7. (b), 8. (c), 9. (b), 10. (c), 11. (a), 12. (d), 13. (b), 14. (b), 15. (d), 16. (b), 17. (c), 18. (c), 19. (b), 20. (c), 21. (b), 22. (d), 23. (b), 24. (b), 25. (a)*]

ASSIGNMENTS

1. Write short notes on :
   (*a*) Effective rate of interest.
   (*b*) Present value of an Annuity Due.
   (*c*) Present value of a Growing Annuity.
2. What is meant by the phrase "present value of a future amount"? How are the present values and future values calculated?
3. "Individuals do have a time preference for money". State the reason for such preference.
4. What is the relevance of time value of money in financial decision making? [*B. Com. (H.), D.U., 2017, 2018]*
5. Explain the discounting technique of adjusting for time value of money.
6. Explain how the discounting and compounding techniques help in sinking funds creation and capital recovery.
7. "Cash flows occurring at different point of time are not comparable". Explain the reason and how can they be made comparable. [*B. Com. (H.), D.U., 2013*]
8. "Incorporation of time value of money helps financial manager is taking better decisions". Illustrate.
9. "Potential analyst should take into account the time value of money". Explain with suitable examples. [*B. Com. (H.), D.U., 2014]*
10. What effect would a decrease in interest rate or an increase in holding period of a deposit have on its future value? Why?
11. Why is the consideration of time important in financial decision making? How can time be adjusted? [*B. Com. (H.), D.U., 2011, 2015*]
12. "TVM does not exist in the absence of inflation." Do you agree? Give reasons.
13. 'A rupee of today is not equal to the rupee of tomorrow'. Explain.

PROBLEMS

P2.1 What is the present value of cash flows of ₹ 750 per year for ever (*a*) at an interest rate of 8% and (*b*) at an interest rate of 10%?

[*Answer :* (*a*) ₹ 9,375, and (*b*) ₹ 7,500.]

P2.2 Find out present value of the following :
   (*a*) ₹ 1,500 receivables in 7 years at a discount rate of 15%;
   (*b*) an annuity of ₹ 760 starting after 1 year for 6 years at an interest rate of 12%;
   (*c*) an annuity of ₹ 5,500 starting in 7 years time lasting for 7 years at a discount rate of 10%;
   (*d*) an annuity of ₹ 1,000 starting immediately and lasting until 9th year at a discount rate of 20%;
   (*e*) a perpetuity of ₹ 400 starting in year 3 at a discount rate of 18%.

[*Answer :* (*a*) ₹ 564, (*b*) ₹ 3,125, (*c*) ₹ 15,100, (*d*) ₹ 4,837 and (*e*) ₹ 1,596.]

P2.3 A company has issued debentures of ₹ 50 lacs to be repaid after 7 years. How much should the company invest in a sinking fund earning 12% in order to able to repay debentures?

[*Answer :* ₹ 4,95,589.]

P2.4 What is the present worth of operating expenditure of ₹ 1,00,000 per year which are assumed to be incurred continuously throughout in 8-year period if the effective annual rate of interest is 12%?

[*Answer :* ₹ 4,96,800.]

P2.5 A firm purchases a machinery for ₹ 8,00,000 by making a down payment of ₹ 1,50,000 and remainder in equal instalments of ₹ 1,50,000 for six years. What is the rate of interest to the firm?

[*Answer :* 10%.]

P2.6 Mr. X borrows ₹ 1,00,000 at 8% compounded annually. Equal annual payments are to be made for 6 years. However, at the time of the fourth payment, the individual elects to pay off the loan. How much should be paid?

[*Answer :* ₹ 60,207.]

P2.7 Ten year from now Mr. X will start receiving a pension of ₹ 3,000 a year. The payment will continue for sixteen years. How much is the pension worth now, if his interest rate is 10%?

[*Answer :* ₹ 9,952.]

P2.8 Novelty Industries is establishing a sinking fund to redeem ₹ 50,00,000 bond issue which matures in 15 years. How much do they have to put into the fund at the end of each year to accumulate ₹ 50,00,000, assuming the funds are compounded at 7% annually?

[*Answer :* ₹ 1,98,973.]

P2.9 XYZ Ltd. is creating a sinking fund to redeem its preference share capital of ₹ 5,00,000 issued on 1-1-2006 and maturing on 31-12-2017. The annual payments will start on 1-1-2006. The company wants to invest equal amount every year, which will earn 12% p.a. How much is the amount of sinking fund annuity ?

[*Answer :* ₹ 18,500 p.a.]

P2.10 X borrows an amount of ₹ 10,00,000 @ 12% p.a. on 1-4-2012. The repayment is to be made in 5 equal annual instalments starting from three years from now. What would be amount of each instalment?

[*Answer :* ₹ 38,974]

PART II

LONG-TERM INVESTMENT DECISIONS : CAPITAL BUDGETING

One of the basic questions faced by financial managers, as discussed in Chapter 1, is : How should the scarce resources of the firm be allocated to get the maximum value for the firm? This refers to investment decisions which deal with investment of firms resources in long term (fixed) Assets and Short term (current) Assets or Capital Budgeting Decisions and Working Capital Management. The working capital management has been discussed in Part V. Capital budgeting is a decision making process for investment in assets that have long term implications, affect the future growth and profitability of the firm and basic composition and assets mix of the firm. It involves :

(*i*) Measuring the benefits and costs associated with each alternative option in terms of incremental cash flows,

(*ii*) Evaluating different proposals in the light of return expected by the investors of the firm and the return promised by the proposal, and

(*iii*) Applying different techniques to select an alternative with the objective of maximization of value of the firm.

Typically, Capital Budgeting decisions involve rather large cash outlays and commit the firm to a particular course of action over a relatively long period and consequently, every care should be taken care of. The future risks and uncertainties should be incorporated in the evaluation procedure so that future cash flows occur as they are intended to be. Part II attempts to discuss, analyze and evaluate different techniques of capital budgeting, incorporation of risk in the analysis and the determination of cost of capital of the firm. The learning objectives are :

- What are the relevant cash flows for Capital Budgeting?
- What are the techniques of evaluation of Capital Budgeting proposals and how to apply them?
- How to evaluate proposals in certain specific situations?

CONTENTS

CHAPTER 3 : CAPITAL BUDGETING : AN INTRODUCTION

CHAPTER 4 : CAPITAL BUDGETING : TECHNIQUES OF EVALUATION

CHAPTER

3

Capital Budgeting - An Introduction

"Many important business decisions require the selection of projects (investments) whose outlays or benefits are spread out over several periods of time. The decision to acquire a factory building, for example, may require a large immediate outlay of funds, and also commits the company to the maintenance and operation of the building for a long period of years. In evaluating investments proposals, it is important to weigh the expected benefits of the investments against the expenses associated with it. For capital budgeting decisions, the costs and benefits are measured more appropriately by the cash flows attributable to the investment."[1]

SYNOPSIS

- Introduction, Features and Significance of Capital Budgeting.
- Types of Capital Budgeting Decisions.
- Capital Budgeting Decision.
  - Costs and Benefits.
  - Assumptions.
  - Procedure.
- Estimation of Costs and Benefits of a Proposal.
  - Accounting Profit *Versus* Cash Flows.
  - Types of Cash Flows.
    - Initial Cash Flows.
    - Subsequent Cash Flows.
    - Terminal Cash Flows.
  - Incremental Approach to Cash Flows.
- Taxation and Cash Flows.
- Treatment of Depreciation and Cash Flows.
- Financial Cash Flows.
- Basic Principles for Calculation of Cash Flows.
- Graded Illustrations in Cash Flows.

1. Bierman H. and Drebin A.R., *Management Accounting : An Introduction*, The Macmillan Company, London, III Printing P. 197.

Capital budgeting decisions are related to the allocation of funds to different long term assets. Broadly speaking, the capital budgeting decision denotes a decision situation where the lump sum funds are invested in the initial stages of a projects and the returns are expected over a long period. Though there is no hard and fast rule to define the long term, yet period involving more than a year may be taken as a long period for investments decisions. The capital budgeting decision involve the entire process of decision making relating to acquisition of long term assets whose returns are expected to arise over a period beyond one year.

Some of the capital budgeting decisions may be to buy land, building or plants; or to undertake a program on research and development of a product, to diversify into a new product line; a promotional campaign, etc. Some of these decisions may directly affect the profit of the firm *e.g.*, launching a new product, whereas some other decision may affect the profit by reducing the costs *e.g.* replacing an existing machine by a more efficient one. But in both the cases, the decision once taken set the profit line of the firm for several years.

All the relevant a functional departments play a crucial role in the capital budgeting decision process of any organization, yet for the time being, only the financial aspects of capital budgeting decisions are considered. The role of a finance manager in the capital budgeting basically lies in the process of critical and in-depth analysis and evaluation of various alternative proposals and then to select one out of these. The objective of capital budgeting is to select those long-term investment projects that are expected to make maximum contribution to the wealth of the shareholders

FEATURES AND SIGNIFICANCE

Capital budgeting decisions are those decisions that involve current outlay in return for a series of benefits in coming years. The capital budgeting decisions are often said to be the most important part of corporate financial management. Any decision that requires the use of resources is a capital budgeting decision; thus the capital budgeting decisions cover everything from broad strategic decisions at one extreme to say computerization of the office, at the other. The capital budgeting decisions affect the profitability of a firm for a long period, therefore the importance of these decisions is obvious. Even a single wrong decision by a firm may endanger the existence of the firm as a profitable firm. There are several factors and considerations which make the capital budgeting decisions as the most important decisions of a finance manager. The relevance and significance of capital budgeting may be stated as follows :

(*a*) **Long-Term Effects :** Perhaps, the most important features of a capital budgeting decision and which makes the capital budgeting so significant is that these decisions have long term effects on the risk and return composition of the firm. These decision affect the future position of the firm to a considerable extent as the capital budgeting decisions have long term implications and consequences. By taking a capital budgeting decision, a finance manager in fact makes a commitment into the future, both by committing to the future needs of funds of the projects and by committing to its future implications.

(*b*) **Substantial Commitments :** The capital budgeting decisions generally involve large commitment of funds and as a result substantial portion of capital funds are blocked in the capital budgeting decisions. In relative terms therefore, more attention is required for capital budgeting decisions, otherwise the firm may suffer from the heavy capital losses in time to come. It is also possible that the return from a projects may not be sufficient enough to justify the capital budgeting decision.

(*c*) **Irreversible Decisions :** Most of the capital budgeting decisions are irreversible decisions. Once taken, the firm may not be in a position to revert back unless it is ready to absorb heavy losses which may result due to abandoning a project in midway. Therefore, the capital budgeting decisions should be taken only after considering and evaluating each and every minute detail of the project, otherwise the financial consequences may be far reaching.

(*d*) **Affect the Capacity and Strength to Compete :** The capital budgeting decisions affect the capacity and strength of a firm to face the competition. A firm may loose competitiveness if the decision to modernize is delayed or not rightly taken. Similarly, a timely decision to take over a minor competitor may ultimately result even in the monopolistic position of the firm.

Thus, the capital budgeting decisions involve a largely irreversible commitment of resources *i.e.*, subject to a significant degree of risk. These decisions may have far reaching effects on the profitability of the firm. These decisions therefore, require a carefully developed decision making process and strategy based on a reliable forecasting system.

PROBLEMS AND DIFFICULTIES IN CAPITAL BUDGETING

The capital budgeting decisions are not only critical and analytical in nature, but also involve various difficulties which a finance manager may come across. The problems in capital budgeting decisions may be as follows :

(*a*) **Future Uncertainty :** All capital budgeting decisions involve long term which is uncertain. Even if every care is taken and the project is evaluated to every minute detail, still 100% correct and certain forecast is not possible. The finance manager dealing with the capital budgeting decisions, therefore, should try to be as analytical as possible. The uncertainty of the capital budgeting decisions may be with reference to cost of the project, future expected returns from the project, future competition, expected demand in future, legal provisions, political situation, etc.

(*b*) **Time Element :** The implications of a capital budgeting decision are scattered over a long period. The cost and benefit of a decision may occur at different point of time. As a result, the cost and benefits of a capital budgeting decision are generally not comparable unless adjusted for time value of money. The cost of a project is incurred

immediately, however, it is recovered in number of years. These total returns may be more than the cost incurred (in absolute terms), still the net benefit cannot be ascertained unless the future benefits are adjusted to make them comparable with the cost. Moreover, the longer the time period involved, the greater would be the uncertainty.

(*c*) **Measurement Problem :** Some times a finance manager may also face difficulties in measuring the cost and benefits of a projects in quantitative terms. For example, the new product proposed to be launched by a firm may result in increase or decrease in sales of other products already being sold by the same firm. But how much ? This is very difficult to ascertain because the sales of other products may increase or decrease due to other factors also.

TYPES OF CAPITAL BUDGETING DECISIONS

Every capital budgeting decision is a specific decision in the given situation, for a given firm and with given parameters and therefore, an almost infinite number of types or forms of capital budgeting decisions may occur. Even if the same decision being considered by the same firm at two different points of time, the decision considerations may change as a result of change in any of the variables. However, the different types of capital budgeting decisions undertaken from time to time by different firms can be classified on a number of dimensions. In general, the projects can be categorized as follows:

From the Point of view of Firm's existence : The capital budgeting decisions may be taken by a newly incorporated firm or by an already existing firm.

(*a*) ***New Firm :*** A newly incorporated firm may be required to take different decisions such as selection of a plant to be installed, capacity utilization at initial stages, to set up or not simultaneously the ancillary unit etc.

(*b*) ***Existing Firm :*** A firm which is already existing may also be required to take various decisions from time to time to meet the challenges of competition or changing environment. These decision may be :

(*i*) *Replacement and Modernization Decision :* This is a common type of a capital budgeting decision. All types of plant and machineries eventually requires replacement. If the existing plant is to be replaced because the economic life of the plant is over, then the decisions may be known as a *replacement decision.* However, if an existing plant is to be replaced because it has become technologically outdated (though the economic life may not be over), the decision may be known as a *modernization decision.* In case of a replacement decision, the objective is to restore the same or higher capacity, whereas in case of modernization decision, the objective is to increase the efficiency and/or cost reduction. In general, the replacement decision and the modernization decisions are also known as *cost reduction decisions.*

(*ii*) *Expansion :* Some times, the firm may be interested in increasing the installed production capacity so as to increase the market share. In such a case, the finance manager is required to evaluate the expansion program in terms of marginal costs and marginal benefits.

(*iii*) *Diversification :* Some times, the firm may be interested to diversify into new product lines, new markets, production of spare parts etc. In such a case, the finance manager is required to evaluate not only the marginal cost and benefits, but also the effect of diversification on the existing market share and profitability. Both the expansion and diversification decisions may also be known as *revenue increasing decisions.*

(*iv*) *Contingent Decisions :* Some times, a capital budgeting decision is contingent to some other decision. For example, computerization of a bank branch may require not only air-conditioning but also transfer of some staff member to other branches. Similarly, installing a project at some remote location may require expenditure or development of infrastructure also. Any capital budgeting decision must be evaluated by the finance manager in its totality. The contingent decision, if any, must be considered and evaluated simultaneously.

From the Point of view of Decision situation : The capital budgeting decisions may also be classified from the point of view of the decision situation as follows :

(*a*) ***Mutually Exclusive Decisions :*** Two or more alternative proposals are said to be mutually exclusive when acceptance of one alternative result in automatic rejection of all other proposals. The mutually exclusive decisions occur when a firm has more than one alternative but competitive proposals before it. For example, selecting one advertising agency to take care of the promotional campaign out rightly rejects all other competitive agencies. Similarly, selection of one location out of different feasible locations is a mutually exclusive decision. The basic rule in mutually exclusive decision situation is :

Only the Best One.

(*b*) ***Accept-Reject Decisions :*** An Accept-Reject decision occurs when a proposal is independently accepted or rejected without regard to any other alternative proposal. This type of decision is made when (*i*) proposal's cost and benefit neither affect nor are affected by the cost and benefits of other proposals, (*ii*) accepting or rejecting one proposal has not impact on the desirability of other proposals, and (*iii*) the different proposals being considered are not competitive. In case of Accept-reject situation, the rule is :

All the Good Ones.

CAPITAL BUDGETING DECISIONS AND FUNDS AVAILABILITY

No business firm can possibly afford to undertake all the profitable proposals. The reason is obvious *i.e.*, no firm has unlimited funds. Had the funds available been unlimited, the firms could have accepted and implemented all the projects which were expected to contribute to the wealth of the firm, however small such contribution was. But this is not so in actual practice. Every firm has only limited funds available and these funds are to be invested in such a way so as to bring maximum contribution to the wealth of the firm.

Therefore, only those decisions are to be implemented which fulfil the following two conditions :

(*i*) The cost of the project does not exceed the funds available, and

(*ii*) The benefits expected from the project are more than the cost.

The situation where the firm is not able to finance all the profitable investment opportunities is known as **capital rationing**. If the total funds required by the profitable opportunities at any particular point of time exceed the available funds with the firm, then the firm is said to be operating under conditions of capital rationing. The capital rationing implies that the firm is unable or unwilling to procure the additional funds needed to undertake all the capital budgeting proposals before it. The problem faced by a finance manager in this situation is as to how to allocate the available scarce capital among various proposal. Out of different independent proposals (accept-reject decisions), only those may be accepted in order of priority which entails the total cost within the limit of available fund. In case of mutually exclusive proposals, the cost of selected proposal must not exceed the available fund.

CAPITAL BUDGETING DECISIONS : ASSUMPTIONS AND PROCEDURE

The capital budgeting decision process, as already stated is a complete multifaceted and analytical process. A finance manager however, has to concentrate only on the financial aspects of the proposal and therefore he is likely to ignore the non-financial considerations. A number of assumptions are required to be made in order to concentrate on the financial aspects. These assumptions in fact constitute a general set of conditions within which the financial aspects of different proposals are to be evaluated. Some of these assumptions are :

1. **Certainty With Respect to Cost and Benefits :** This assumption implies that the cost and benefits associated with a proposal are known with certainty. It may be difficult to estimate the cost and benefits proposals for a period beyond 2-3 years in future. However, for a capital budgeting decision, it is assumed that accurate forecast of cost and benefits of a proposals is available for the entire economic life of the proposal. Moreover, it is reasonable to resolve the certainty problem before being concerned with the process of capital budgeting decisions.
2. **Profit Motive :** Another assumption is that the capital budgeting decisions are taken with a primary motive of increasing the profit of the firm. No other motive or goal affect the underlying efforts of the finance manager.
3. **No Capital Rationing :** The capital budgeting decisions being discussed here assume that there is no scarcity of capital funds and the firm is not faced with capital rationing.

The capital budgeting decision procedure basically involves the evaluation of the desirability of an investment proposal. It is obvious that the firm must have a systematic procedure for making capital budgeting decisions. The procedure must be consistent with the objective of wealth maximization. In view of the significance of capital budgeting decisions, the procedure must consist of step by step analysis. The finance manager should use the best information and techniques available to take the capital budgeting decisions. In the process, he may undertake the following steps :

(*a*) **Estimation of Costs and Benefits of a Proposal :** The most important step required in the capital budgeting decisions is to estimate the cost and benefit associated with all the proposals being considered. The cost of a proposal is generally the capital expenditure required to install a project or to implement a decision. However, the benefits of a proposal may be in the form of increased output, increased sales, reduction in labour cost, reduction in wastages etc. Every proposal is to be examined in the light of its cost and benefits. The estimation of cost and benefit has been discussed at a later stage in the same chapter.

(*b*) **Estimation of the Required Rate of Return :** The rate of return expected from a proposal is to be estimated in order to (*i*) adjust the future cost and benefit of a proposal for time value of money, and (*ii*) thereafter, determining the profitability of the proposal. This required rate of return is also known as Cost of Capital and has been discussed in detail in Chapter 5. The funds available to a firm can either be invested in a capital budgeting proposal or can be invested elsewhere. So, a firm should invest the funds in a capital budgeting proposal, only if the return is at least equal to the return available from investments made elsewhere. This rate of return is known as opportunity cost or minimum required rate of return. It is used as a discount rate in capital budgeting.

(*c*) **Using the Capital Budgeting Decision Criterion :** A proper capital budgeting technique is to be applied to select the best alternative. So, in the first instance the technique itself is to be selected and then is to be applied for a better decision making. This step deals with the analysis of different capital budgeting techniques and has been discussed in detail in Chapter 4.

However, in the following paragraphs, the first step *i.e.*, the estimation of cost and benefits has been discussed in detail.

ESTIMATION OF COSTS AND BENEFITS OF A PROPOSAL

The selection or rejection of a proposal is based on the careful evaluation of costs and benefits related to the proposal. In the capital budgeting procedure, the estimation of cost and bene-

fits of different proposals being considered for decision making is the first step. The estimation of cost and benefits may be made on the basis of input data being provided by production, marketing, accounting or any other department. What is required is the synchronization of this data and to make an attempt to forecast the costs and benefits of a proposal. But the question at this stage is how to measure the cost and benefits of a proposal ?

Two alternatives are suggested for measuring the cost and benefits of a proposal *i.e.*, the accounting profits and the cash flows.

1. **Accounting Profit :** The benefits of a proposal may be measured in terms of the profit generated by it or in terms of a measure based on accounting profits. However, the accounting profit, which otherwise is a good, estimate of judging the efficiency of any firm, may not be a good measure to estimate the value/benefit created by a proposal. The accounting profit as a measure of benefits of a proposal is discarded on the following grounds :

   (*a*) The accounting profit is, to a large extent, affected by the discretionary accounting policies being followed by the firm. These policies, which usually differ from one firm to another or from one period to another, may be depreciation policy, inventory valuation policy, capital expenditure and revenue expense policy, etc. Thus, the accounting profit is not an objective figure.

   (*b*) The accounting profit is affected by so many non-cash items such as depreciation, writing off the accumulated losses, etc. The balancing profit figure after these item is not a true measure of benefits contributed by a proposal.

   (*c*) The accounting profit measures the profit of any particular year in terms of the money of that year. However, the cost and benefits of a proposal may occur over a period of number of year. The benefits if measured in terms of accounting profit, are expressed in monies of different time period and are not comparable. Similarly, if two mutually exclusive proposals have different economic lives, then the accounting profits emerging over different periods are not comparable.

   (*d*) The accounting profit is based on the accrual concepts. For example, the sales revenue and the expenses, both are recorded for the period in which they occur instead of the period in which they are actually received or paid.

   Thus, in view of these flaws, the accounting profit as a measures of benefits of a proposal is out rightly rejected. Instead, the cost and benefits are measured in terms of cash flows.

2. **Cash Flows :** In capital budgeting, the cost and benefits of a proposal are measured in terms of cash flows. The term cash flow is used to describe the cash movement arising because of a proposal. Though it may not be possible to obtain exact cash-effect measurement, it is possible to generate useful approximations based on available accounting data. The costs are denoted as cash outflows whereas the benefit are denoted as cash inflows. It may be noted that the cash outflows represent outflows of purchasing power and cash inflow is an inflow of purchasing power. The cash outflows and inflows are used to denote the cost and benefit of a proposal.

It may be noted that the accounting profit figure is the resultant figure on the basis of several accounting concepts and policies. Some of the costs which are deducted from the sales revenue to arrive at the profit figure do not involve any cash flow. These charges against profit are simply book entries. For example, depreciation, provision for bad and doubtful debts, writing off the goodwill, etc., do not involve any cash flow. Similarly, a capital expenditure though involving a cash payment is not considered as the cost for the period and hence is not deducted from the sales revenue. Therefore, there is a difference between accounting profit and cash flow. This difference arises because of non-cash transactions. This can be substantiated as follows : The following is the income statement of a firm :

	Amount	**Amount**
Sales Revenue		₹ 1,00,000
– Cost of Production	₹ 60,000	
– Depreciation	15,000	75,000
Profit before Tax		25,000
– Tax @ 40%		10,000
Profit after Tax		15,000

Now, presuming that all the sales, expenses and taxes have been effected in cash, the cash flow position of the firm can be expressed as follows :

	Amount	**Amount**
Cash realized from sales		₹ 1,00,000
– Cost of Production	₹ 60,000	
– Taxes paid	10,000	70,000
Cash increase (*i.e.*, cash inflow)		30,000

The difference between the Profit after tax (*i.e.*, ₹ 15,000) and cash inflow (*i.e.*, ₹ 30,000) is due to the existence of non-cash expense of depreciation of ₹ 15,000. On the basis of this example, the cash flow may be stated as follows :

Cash flow = Profit after Tax (PAT) + Non-cash expenses (N/C Exp.)

Further, if the firm has spent ₹ 5,000 on capital expenditure, then this will not affect the profit figure but the cash flow will be reduced by ₹ 5,000 as follows :

$$\begin{aligned} \text{Cashflow} &= \text{PAT} + \text{N/C Exp.} - \text{Capital Expenditures} \quad (3.1) \\ &= ₹\ 15{,}000 + ₹\ 15{,}000 - ₹\ 5{,}000 \\ &= ₹\ 25{,}000 \end{aligned}$$

Equation 3.1 depicts that even if sales and operating expenses are effected in cash, the profit of the firm and the cash flows may be different. The reason for this difference may be the non-cash expenses and the existence of capital expenditure.

Example 3.1

The cost of a plant is ₹ 5,00,000. It has an estimated life of 5 years after which it would be disposed off (scrap value *nil*). Profit before depreciation, interest and taxes (PBIT) is estimated to be ₹ 1,75,000 p.a. Find out the yearly cash flow from the plant, (given the tax rate @ 30%).

Solution :

Annual depreciation charge (₹ 5,00,000/5)	1,00,000
Profit before depreciation, interest and taxes	1,75,000
– Depreciation	1,00,000
Profit before Tax	75,000
Tax @ 30%	22,500
Profit after Tax	52,500
+ Depreciation (added back)	1,00,000
Therefore, cash flow	1,52,500

Example 3.2

ABC Ltd. is evaluating a capital budgeting proposal for which relevant figures are as follows :

Cost of the Plant	₹ 11,00,000
Installation cost	₹ 3,400
Economic life	7 years
Scrap value	₹ 30,000
Profit before depreciation and tax	₹ 2,00,000
Tax rate	50%

Solution :

Annual depreciation charge (₹ 11,03,400 - ₹ 30,000)/7	₹ 1,53,343
Profit before depreciation and taxes	2,00,000
– Depreciation	1,53,343
Profit before Tax	46,657
– Tax @ 50%	23,329
Profit after Tax	23,328
+ Depreciation (added back)	1,53,343
Cash inflow (yearly)	1,76,671

The plant has an initial cash outflow of ₹ 11,03,400 (₹ 11,00,000+₹ 3,400), and its annual cash inflows for 7 year will be ₹ 1,76,671 p.a. However, in the 7th year, there will be an additional cash inflow of ₹ 30,000 *i.e.*, the scrap value. Therefore, in the 7th year, the total cash inflow will be ₹ 2,06,671.

Examples 3.1 and 3.2 make an assumption that all the sales and expenses have been effected in cash. However, in practice there is a time gap between the occurrence of sales and expenses and their incidence on cash flow. Thus, pattern of receipts from receivables (debtors and bill) and the pattern of payments to payable (creditors and bills) should also be analyzed to assess the effect on cash flow.

Cash Flows *versus* Accounting Profit : The accounting profits are calculated for stewardship purposes and are period-oriented. Moreover, the accounting policies relating to depreciation, inventory valuation, and allocation of indirect costs may cause wide discrepancies in accounting profit in identical situation. These problems may all be overcome by focusing on the cash flows which will be identical irrespective of the person making estimation thereof. The concept of cash flows as a measure of evaluating the cost and benefits of a proposal is better than the concept of accounting profit in more than one ways as follows :

(*a*) The accounting profit ignores the concept of time value of money, whereas the cash flow incorporates the time value of money also.

(*b*) In capital budgeting, a finance manager is concerned with measuring the economic value created by a decision rather than book entry value. In cash flow analysis, the cost and benefits are measured in terms of actual cash inflows and outflows rather than profit figure.

(*c*) The accounting profit may be influenced and affected by adopting one or the other accounting policy, however the cash flow are the actual flows and are not affected by any such discretionary policy of the firm.

Thus, the cash flows as a measure of cost and benefits of a proposal is a better technique to evaluate a proposal. The cash flows associated with a proposal may be classified into :

(*i*) Original or Initial cash outflow,
(*ii*) Subsequent cash inflows and outflows, and
(*iii*) Terminal cash flow.

1. **Original or Initial Cash Outflow :** All the capital projects require a sizeable initial cash outflow before any future inflow is realized. This initial cash outflow is needed to get a project operational. In most of the capital budgeting proposals, the initial cost of the project *i.e.*, the initial investment cost is the cash outflow occurring in the initial stages of the projects. Since the investment cost occurs in the beginning of the project, it is relatively easy to identify the initial cash outflows. It reflects the cash spent to acquire the asset. There are several points worth noting here as follows :

   (*a*) ***Installation cost :*** The initial cash outflow includes the total cost of the project in order to bring it in workable condition. Thus, the initial cash outflow includes not only the cost of plant, but also the transportation cost, installation cost and any other incidental cost.

   (*b*) ***Sunk cost :*** Sunk cost is that cost which the firm has already incurred and thus has no effect on the present or future decisions. If a firm which owns a plot of land which is lying idle for the time being, is now considering to construct a factory at this plot, then the cost of the plot is a sunk cost for the factory proposal, and is irrelevant. However, if the plot of land is to be purchased now, then the cost of the land will be included in the initial cost of the project.

   Suppose, the firm had spent ₹ 50,000 to erect a fence on this plot of land, when it was lying idle. This cost of fence is also a sunk cost even if the fence is required for the factory project. However, if the

fence is not required and is to be removed before the new factory building is constructed, then the cost of removal would be a relevant cost and is to be added to the initial cost of the project.

Similarly, expenses incurred on conducting a market survey to assess the potential market, or associated with research and development activities occurring well before the product is considered for introduction are sunk costs for a product now under full investment analysis. The sunk costs are neither recovered if the proposal is rejected nor incremental if the project is accepted, and therefore, should not be considered in the capital budgeting decision process.

The sunk cost is an irrelevant cost for the investment proposal and is to be ignored. If the sunk cost is included in the initial cash outflow then the finance manager may commit the sunk cost fallacy. It may be noted however that although the sunk costs are irrelevant for capital budgeting proposals yet the firm does need to recover these costs over time otherwise the firm will cease to exists.

(*c*) ***Salvage value of Existing Asset :*** In case of replacement decisions, the salvage value of the existing asset is an inflow. If the firm decides to replace the existing asset then the outflow would occur on the new asset and simultaneously, an inflow would occur from the sale of the old. This salvage value is deducted from the outflow to find out the net initial outflow. Further, that the sale of old asset may result in some profit or loss on sale of asset. For example, if the book value of the asset, being scrapped, is ₹ 1,00,000 and it is sold for ₹ 1,80,000. This would be result in a capital loss of ₹ 20,000. Or, if the asset is sold for ₹ 1,25,000, there would be a capital gain of ₹ 25,000. This profit or loss would affect the taxable income and the tax liability. The profit on sale would involve additional tax payment and loss on sale would result in tax saving, while finding out the initial outflows of a capital budgeting decision situation. The salvage value of the existing asset, as well as the tax effect of profit or loss on sale, both are considered.

(*d*) ***Opportunity Cost :*** In some cases the finance manager may overlook some of the costs of proposal. Such costs may be the opportunity costs of some resources which are already available or being procured in the firm. Using of some resources, such as office space, for a new proposal by divesting them from some other existing use, causes the opportunity costs. When a firm uses such resources, by divesting, there is a potential for opportunity cost *i.e.*, the cost created for the rest of the business as a consequence of the proposal. This opportunity cost may be a significant portion of the total cost of the proposal.

The general framework for analyzing the opportunity costs begins by asking the question, "Is there any other use for this resource right now ?" For many resources, there will be an alternative use if the project being analyzed is not undertaken. The opportunity cost may occur as follows :

(*i*) The resource might be rented out, in which case the rental revenue is the opportunity lost by taking this project.

(*ii*) The resource could be sold, in which case the sales price (net of tax liability and lost depreciation tax benefits) would be the opportunity cost of taking this project.

(*iii*) The resource might be used elsewhere in the firm, in which case the cost of replacing the resource is considered as the opportunity cost.

Thus, the transfer of experienced employees from established divisions to a new project creates a cost to these divisions and has to be considered for decisions making. Similarly, if the office building is to be constructed on an idle plot of land, then the cost of land is a sunk cost for the building project and be ignored therefore. But, if the firm did not use the plot for building purpose, it could sell it or use it for some other project and thus the plot of land has an opportunity cost. So, the firm should include the market value of the land as the part of the initial cost of the project. The amount originally paid for acquiring the plot is a sunk cost and is irrelevant.

(*e*) ***Additional Working Capital Requirement :*** Another item that needs consideration to ascertain the initial cash outflow is the working capital required for the proposal or more precisely, the change in working capital due to the proposal. Since the change in working capital affects the cash flows, it is important that the working capital requirement of every alternative proposal be analyzed and considered for the capital budgeting decision.

An investment proposal if accepted, would require increase in minimum cash balance to be maintained, higher inventory level and more receivables. The new project may require the firm (*i*) to extend additional credit to its customers, (*ii*) to carry additional inventory to serve customer orders, and (*iii*) to enlarge its cash balance to meet its enlarged transactions.

This additional working capital is the additional investment to be made in the project, and is therefore, also included in the initial cash outflows of the project. However, the additional working capital is required only for the period equal to the life of the proposal. At the end of the proposal, this additional working capital being invested now will be released and recaptured by the firm. Thus, the cash inflow for the last year of the life of the project would also include the working capital released by the project.

Failure to consider the working capital needs in the capital budgeting decision may have two consequences *i.e.*, (*i*) the cash flows will be over-estimated and (*ii*) even if, working capital is salvaged fully at the end of the project life, the net

present value of the cash flows created by change of working capital will be negative and hence the capital budgeting decision may be taken wrongly.

2. **Subsequent Annual Inflows and Outflows :** The original investment cost or the initial cash outflow of the proposal is expected to generate a series of cash inflows in the form of cash profits contributed by the project. These cash inflows may be same every year throughout the life of the project or may vary from one year to another. The timings of the inflows may also be different. The cash inflows mostly occur annually, but in some cases may occur half-yearly or biannually also. These cash inflows generated during the life of the project may also be called *operating cash flows*. There are different ways of finding out the operating cash inflows. These can be explained as follows :

Sales	₹ 1,50,000
– Costs	70,000
– Depreciation	60,000
Profit before tax	20,000
Tax @ 34%	6,800
Profit After Tax	13,200

Operating cash inflows (OCF) may be found as under :

(*i*) OCF = PBT + Dep. – Tax
= ₹ 20,000 + 60,000 – 6,800 = ₹ 73,200

(*ii*) OCF = PAT + Dep.
= ₹ 13,200 + 60,000 = ₹ 73,200

(*iii*) OCF = Sales – Cash Costs – Taxes
= ₹ 1,50,000 – 70,000 – 6,800 = ₹ 73,200

(*iv*) OCF = (Sales – Cash Costs) (1 – t) + Dep. (t)
= (₹ 1,50,000 – 70,000) (1 – .34) + ₹ 60,000 (.34)
= ₹ 73,200

The Operating cash flows are positive cash flows for most of the conventional revenue generating proposals, however, in case of cost reduction proposals these cash flows may be negative.

Following points are worth noting here :

1. Sometimes, the project may require some subsequent cash outflows also in the form of periodic intensive repair, periodic shunting cost, etc. All these cash inflows and outflows are to be considered for the capital budgeting decision.
2. If additional working capital is required by the proposal in any of the subsequent years then it should be considered as outflow for that year. However, if the working capital is released in any of the subsequent years, then it should be considered as cash inflow for that year.
3. It is important to recognize the timing of these subsequent cash inflows and outflows, as these are to be adjusted for the time value of money. The more quickly and earlier, the cash inflows occur, the more valuable these are.

So, subsequent annual cashflow can be described as :

> Annual Inflow = PAT + Non-cash expenses – Capital expenditure ± Change in Working Capital

3. **Terminal Cash Inflows :** The cash inflows for the last year will also include the terminal cash flows in addition to annual cash inflows. Two common terminal cash inflows may occur in the last year. First, as already noted, the estimated salvage or scrap value of the project realizable at the end of the economic life of the project or at the time of its termination is the cash inflow for the last year. At the time of disbanding or termination of the project, the market value of the land *etc.* also become cash inflows from the project. Second, as already noted, the working capital which was invested (tied up) in the beginning will no longer be required as the project is being terminated. This working capital released will be available back to the firm and is considered as a terminal cash inflow. So,

> Terminal CF = Sale Price of asset ± Tax effect of sale of asset + Working Capital released.

INCREMENTAL APPROACH TO CASH FLOWS

In capital budgeting, the cash flows are measured in the incremental terms *i.e.,* only those cash flows are considered, that differ or occur as a result of undertaking/accepting the particular proposal. These incremental cash flows are also known as relevant cash flows. These refer to those cash flows which can be associated and attributed to adoption of a particular proposal.

So, what is a relevant cash flow ? In general, a relevant cash flow for a project is a change (in the firm's future cash flows) that occurs as a direct consequence of the decision to accept that project. As the relevant cash flows are defined in terms of changes in a increments to the existing cash flows, these are called incremental cash flows. The concept of incremental cash flows is central to the process of capital budgeting.

Any cash flows that exists or is expected to occur regardless of whether a project is taken up or not, is not a relevant cash flow and is ignored in capital budgeting. Following points are worth nothing about incremental cash flows :

(*i*) **Stand Alone Principle :** If an existing firm is taking up a new project, then it would be very tedious and cumbersome to actually calculate the total future cash flows of the firm with or without that project. In order to avoid this situation, the stand alone principle is applied and only the effect of project's cash flows on the firm's otherwise cash flows is identified.

'Stand Alone Principle' implies that each project is a 'minifirm' within the larger firm. Each 'minifirm' has its costs, revenues and cash flows. So, the 'minifirm' be evaluated on the basis of its own cash flows, rather than the total cash flows of the firm. Thus, a project is evaluated purely on its own merits, in isolation from other activities of the firm.

(*ii*) **Co-existence with the proposal :** The incremental cash flows are those which co-exist with a proposal *i.e.,* the particular cash flows may appear only if the project is undertaken. For example, ABC & Co. is evaluating project X and project Y. The project X requires an intensive

repairs costing ₹ 1,00,000 at the end of 5th year, while the project Y necessitates an annual service contract for ₹ 25,000 p.a. In this case, the repair cost of ₹ 1,00,000 is relevant for project X only, while the annual cash outflow of ₹ 25,000 is relevant for project Y only. The repair cost is not required if project Y is implemented and the service contract is not required if the project X is installed.

(*iii*) **Allocated Overhead costs :** The overhead costs are those which are not directly related to a product. These are allocated to a product on some rational basis such as machine-hour rate etc. These overhead costs which are already being incurred by the firm and perhaps also being charged from the goods produced presently, are irrelevant from the point of view of new project. If therefore, some existing overhead cost is allocated to the new proposal, then this is not to be considered for finding out relevant cash flows of the proposal. Moreover, it is not incremental. However, if the overhead costs is expected to increase after the new project is implemented, then only this incremental overhead cost will be considered as costs and the cash outflow for the proposal.

For example, any increase in administrative or staff cost that can be traced to the project is an incremental cost and should be considered. One way to estimate the incremental component of these costs is to break them down on the basis of whether they are fixed or variable, and, if they are variable, what they are a function of.

(*iv*) **Product Cannibalization :** This refer to the phenomenon whereby a new product introduced by a firm competes with and reduces sales of some other existing product of the same firm. The product cannibalization refers to the sales generated by one product, which come at the expense of other products being sold by the same firm. It can be argued that this is a negative effect of the new product, and the lost cash flows or profit from the existing products should be treated as costs in analyzing whether or not to introduce the product.

The decision whether or not to include the cost of lost sales created by product cannibalization will depend on the potential for a competitor to introduce a close substitute to the new product being considered. Two extreme possibilities exist :

(*i*) If the business in which the firm operates is extremely competitive and there are no barriers to entry, it can be assumed that the product cannibalization will occur any way, and the costs associated with it have no place in an incremental cash flows analysis.

(*ii*) If a competitor cannot introduce a substitute, because of legal restrictions such as patents, the cash flows lost as a consequence of product cannibalization should be included in the capital budgeting analysis, at least for the period of the patent protection.

In most cases, there will be some barriers to entry, ensuring that a competitor will either introduce an imperfect substitute, leading to much smaller erosion in existing product sales, or that a competitor will not introduce a substitute for some period.

In this case, an intermediate solution whereby some of the product cannibalization costs are considered, may be appropriate. Firms with stronger brand name loyalty should include into their capital budgeting analysis, most of the cost of lost sales resulting as a consequence of new product.

The principle of incremental cash flows in capital budgeting analysis is critical. A finance manager while evaluating a proposal should note whether a particular cash flow is incremental or not. Only the incremental cash flows should be considered for capital budgeting. Any cash inflow or outflow that can be directly or indirectly traced to a project must be considered. Obviously, the incremental cash flows analysis also implies that any reduction in cash inflow or outflow that occurs as a consequence of a project should also be considered.

TAXATION AND CASH FLOWS

The cash flows that are related to capital budgeting decisions are the after-tax cash flows only. The after-tax cash flows resulting from a project are in fact the relevant incremental cash flows. These after-tax cash flows would not occur if the project is not undertaken.

The annual cash inflow from a project will result in increase in the taxable profit. So, the cash flow from a project would also affect the tax liability of the firm. The increase in tax liability will be equal to the cash inflow multiplied by the tax rate. Or, the net cash inflow will be equal to cash inflow (before tax) multiplied by (1-tax rate). Therefore, the relevant cash flow for a capital budgeting decision is the cash flow net of incremental tax liability. It may be noted that in Chapter 1, one of the axioms of financial management has been given as ***"All financial decisions are subservient to tax-laws".***

So, the capital budgeting analysis should be done in after-tax terms. This implies that all items that affect taxes, even non-cash item such as depreciation, should be considered in the analysis.

DEPRECIATION, NON-CASH ITEMS AND CASH FLOWS

The fixed assets acquired as a result of capital budgeting decision would be depreciated in the usual way. The depreciation of the assets would reduce the expected profit being generated by the project, reducing the tax liability. Even though this depreciation does not involve any cash flow as such, it definitely affects the cash outflows by affecting the tax liability. One consequence of dealing with after tax cash flows in capital budgeting decision process is that non-cash charges can have a significant impact on the cash flows, if they affect the tax liability. Some non-cash charges, particularly depreciation, reduces the taxable income and hence reduces the tax liability, without however affecting the cash flows.

Every capital budgeting decision should therefore, consider this depreciation tax-shield *i.e.*, reduction in tax liability as a result of depreciation. The depreciation is added back to the figure of profit after taxes to arrive at the cash inflows from the project. Similarly, any other non-cash expense which has already been deducted to arrive at the figure of profit after

tax, is added back to ascertain the cash inflows even though they may not provide any tax benefit to the firm.

TREATMENT OF DEPRECIATION AND PROFIT/ LOSS ON SALE/SCRAPPING OF AN ASSET

In order to find out the relevant cash inflows for a capital budgeting proposal, the amount of depreciation should be carefully ascertained. As already said, the depreciation is tax deductible and provides a tax-relief. At the end of useful life of an asset, it might be sold for some scrap value. The cash inflow in the form of scrap value is also considered in the evaluation process. The tax-effect of depreciation and scrap value may be incorporated in the capital budgeting evaluation procedure in any of the following two ways :

I. Accounting Treatment

In accounting, an asset can be depreciated as per any of several methods of depreciation. The depreciation charge for a particular year is deducted from the opening written down value of the asset to get the closing written down value. The depreciation is provided for the entire period for which the asset has been used. At the time of scrapping of an assets, its salvage value is compared with the written down value till date. The difference between the two *i.e.*, capital gain (when salvage value is more than the written down value) or the capital loss (when the salvage value is less than the written down value) is adjusted in the income of the year in which the asset is discarded. Consequently, the capital gain/loss will have its tax effect.

Example 3.3

A firm buys an asset costing ₹ 1,00,000 and expects operating profits (before depreciation @ 20% WDV and tax @ 30%) of ₹ 30,000 p.a. for the next four years after which the asset would be disposed off for ₹ 45,000. Find out the cash flows for different years.

Solution :

Initial Outflow : Cost of the Asset ₹ 1,00,000

Subsequent Annual Inflows : The subsequent cash inflows from the asset may be found as under :

Year	WDV	Dep.	PBD	PBT	Tax	PAT	CF
	(1)	(2)	(3)	(4=3-2)	@30%	(5)	(5+2)
1.	1,00,000	20,000	30,000	10,000	3.000	7,000	27,000
2.	80,000	16,000	30,000	14,000	4,200	9,800	25,800
3.	64,000	12,800	30,000	17,200	5,160	12,040	24,840
4.	51,200	10,240	30,000	19,760	5,928	13,832	24,072

Terminal Cash Inflow:

Scrap Value of the Asset		₹ 45,000
Profit on sale :		
Sale Value	45,000	
WDV (51,200 – 10,240)	40,960	
Profit	4,040	
Tax @ 30% on ₹ 4,040		₹ 1,212
Net Cash Inflow (45,000 – 1,212)		₹ 43,788

II. Treatment under the Income-tax Act, 1961

The taxable income of an assessee in India is calculated as per the provisions contained in the Income-tax Act, 1961. The relevant provisions are given in Sections 32 and 43 of the Act. The treatment of depreciation and capital gain/loss to find out the tax liability is different from the accounting treatment given above. The treatment under the Income-tax Act may be summarised as follows :

Block of Assets : The provisions of the Act introduces the concept of block of assets. The block of assets means a group of assets falling within a class of assets being buildings, machinery, furniture etc., in respect of which the same rate of depreciation is admissible. Depreciation is allowed on the basis of block of assets. A block of assets may consist of one asset or several assets.

Block consisting of one asset only : If there is only one asset in a particular block of assets then the following provisions are worth noting :

(*a*) In the terminal year (*i.e.*, the year in which the asset is discarded/sold or scrapped away), no depreciation is allowed.

(*b*) The selling price/scrap value will be compared with the written down value. The difference between the two is treated as short term capital gain or loss and is treated as ordinary income/loss.

Block consisting of more than one asset : In case, there are more than one asset in a block, the following provisions are worth noting :

(*i*) When a new asset is purchased and is added to the existing block of asset, the cost of new asset is added to the opening written down value of the block and depreciation for that year is provided on the total value.

(*ii*) If at the time of acquisition of new asset or even otherwise, any part of the block is sold or scrapped away, then the scrap value (realised from sale) is deducted from the opening written down value. The depreciation for the year is provided on the net balance only. For example, if the opening written down balance of a block of asset is ₹ 10,00,000. During the year, assets costing ₹ 7,50,000 are added to the block. The depreciation for the year will be provided on ₹ 17,50,000. However, if a part of this block is sold away for ₹ 3,50,000 (irrespective of the WDV), the depreciation for the year would be provided on ₹ 14,00,000 only.

(*iii*) There will not be any capital gain/loss on sale of asset unless the entire block of asset is scrapped away. In such a case, the difference between the written down value and the scrap value will be the short term capital gain/ loss and treated accordingly.

In the Example 3.3 above, if the block is consisting of one asset only, then the depreciation for different years would be ₹ 20,000, ₹ 16,000, ₹ 12,800 and *NIL* for years 1-4 respectively. The WDV in the beginning of the year 4 would be ₹ 51,200 and short term capital loss would be ₹ 6,200 *i.e.*, (₹ 51,200 – 45,000).

However, if the block is consisting of several assets, and the WDV of the existing assets (on the date of purchase of new asset) is say, ₹ 5,00,000, then the depreciation for different years would be calculated @ 20% WDV on ₹ 6,00,000. The depreciation would be ₹ 1,20,000, ₹ 96,000, ₹ 76,800 for years 1-3 respectively. The WDV of the block in the year 4 would be ₹ 3,07,200 and the depreciation for the year 4 would be ₹ 52,440 *i.e.*, 20% of (₹ 3,07,200 – 45,000).

Further, there would not be any capital gains/loss in the year 4 when a part of block of asset is sold for ₹ 45,000. It may be noted from the above discussion that the depreciation under the accounting treatment and the depreciation as per the Income-tax Act, 1961 would be different. This implies that the tax benefit available from depreciation will also be different. This will result in different cash flows under two methods of depreciation.

FINANCIAL CASH FLOWS

Any new project being considered for implementation may require the firm to raise additional funds. This may also entail further cash flows in the form of payment of interest or dividend to the supplier of the funds. In the capital budgeting decision process, these financial cash flows *i.e.*, cash inflows in the form of raising the funds and cash outflows in the form of interest and dividend payments, are ignored. The reason for the exclusion of financial cash flows is obvious.

The cash inflow arising at the time of raising of additional fund results in an immediate cash outflow also when these funds are used to procure the project. As such, there is no net cash inflow. Further, the cost of financing in the form of interest and dividend is truly reflected in the weighted average cost of capital which is used to evaluate the proposals. The concept of weighted average cost of capital has been discussed in Chapter 5. If the cost of debt or equity (*i.e.*, interest or dividends) is deducted from the cash inflows, then this cost of raising fund will be counted twice, first in the cash inflows and second, in the weighted average cost of capital. This is also known as ***Interest Exclusion Principle***.

The interest payable to the lenders and the dividend payable to the shareholders are cashflows to the supplier of funds and not cashflow from the project. In capital budgeting, the cashflow from the project are compared with the cost of acquiring that project. A particular capital mix, the firm uses to finance the project is a managerial variable and primarily determines how project cashflows are divided between lenders and owners.

Thus, neither, the additional funds raised nor the interest/dividend payable on these funds are treated as relevant cash flows for a proposal. Otherwise, there will be an error of double counting. The general principle is that the investment decision and the financing decision should be considered separately. In other words, only the operating cash flows of a proposal should be brought into and evaluated in the capital budgeting process. The financial cash flows should be taken as constant and be kept outside the analysis. Example 3.4 illustrates this point.

Example 3.4

Following is the income statement of a project, on the basis of which calculate the annual cash inflows.

Income Statement of the Project

Net Sales revenue		₹ 4,75,000
– Cost of Goods Sold	₹ 2,00,000	
– General Expenses	1,00,000	
– Depreciation	50,000	3,50,000
Profit before interest and taxes		1,25,000
– Interest		25,000
Profit before tax		1,00,000
– Tax @ 30%		30,000
Profit after tax		70,000

Solution :

The Income statement of the project shows that an interest charge of ₹ 25,000 is payable on the funds raised for financing the project. This interest payment is a charge for ascertaining the accounting profit, but is irrelevant for ascertaining the cash flows. Therefore, the annual cash flow from the project can be calculated as follows :

CALCULATION OF ANNUAL CASH INFLOWS

Net Sales revenue		₹ 4,75,000
– Cost of Goods Sold	₹ 2,00,000	
– General Expenses	1,00,000	
– Depreciation	50,000	3,50,000
Profit before interest and taxes		1,25,000
– Tax @ 30%		37,500
		87,500
+ Depreciation (added back)		50,000
Annual cash inflow		1,37,500

The cash inflow can also be ascertained as follows :

Net Profit (as shown in Income Statement)	₹ 70,000
+ Depreciation	50,000
+ Interest	25,000
	1,45,000
– Tax-effect of interest (₹ 25,000 × 30%)	7,500
Annual cash inflow	1,37,500

On the basis of the above analysis of financial cash flows, the annual cash inflow may be defined in terms of the following equation :

$$\text{Cash inflow} = \text{PAT} + \text{Non-Cash Expenses} + \text{Financial Charge} - \text{Financial charge} \times (\text{Tax rate})$$

$$= \text{PAT} + \text{Depreciation} + \text{Interest} - \text{Interest} \times (\text{Tax rate})$$

$$= \text{PAT} + \text{Depreciation} + \text{Interest} \times (1 - \text{Tax rate})$$

or, $$= \text{EBIT} \times (1 - \text{Tax rate}) + \text{Depreciation}$$

If there is a change in net working capital in any year, then it should also be incorporated as follows :

Cash inflow = PAT + Depreciation + Interest – Interest (Tax rate) – Increase in working capital.

Cash inflow = EBIT (1 – Tax rate) + Depreciation – Increase in Net Working Capital.

The cash flows may be grouped into relevant and irrelevant cash flows as follows :

Relevant Cash Flows	Irrelevant Cash Flows
Cost of new project	Sunk Cost
Scrap value of old/new plant	Allocated Overheads
Trade-in-value of old plant	Financial cashflows
Cost reduction/savings	
Effect on tax liability Incremental repairs	
Tax benefit of Incremental depreciation	
Working capital flows	
Revenue from new proposal etc.	

In the ultimate analysis, the calculation of different cash flows may be summarized as follows :

Initial Cash Outflow = Cost of new plant + Installation Expenses + Other Capital Expenditure + Additional Working Capital – Tax benefit on account of Capital loss on sale of old plant (if any) – Salvage value of old plant + Tax Liability on account of Capital gain on sale of old plant (if any).

Subsequent Cash Inflow = Profit after Tax + Depreciation + Financial charge (1 – t) – Repairs (if any) – Capital Expenditure (if any).

Terminal Cash Inflow = Annual Cash inflow + Working Capital released + Scrap value of the proposal (if any).

Basic Principles for calculation of Cash Flows of a Capital Budgeting Project

1. All relevant cash flows are considered.
2. Cash Flows are considered on after-tax basis.
3. Cash Flows are considered on incremental basis.
4. Tax saving is considered as an inflow.
5. Sunk costs are ignored (as these are not incremental).
6. Opportunity costs are considered (as these are sacrificed).
7. Additional working capital required for a project is considered as an outflow (as the funds are blocked for the life time of the project). At the end of life of project, these funds (blocked in working capital) are released back and are considered as Terminal Inflow.
8. Unless given otherwise, inflows are assumed to have occurred at the end of the year and outflows are assumed to have occurred in the beginning of the year.
9. In Replacement Decisions, savings in costs are considered as inflow on after-tax basis.
10. Allocated Overheads are not outflows (as these are not incremental and are being already recovered elsewhere).

POINTS TO REMEMBER

- Investment decisions are concerned with the allocation of funds to different types of assets : long-term as well as short-term Capital budgeting is concerned with long term decision.
- The basic features of Capital budgeting are long term effects, substantial commitments, irreversible decisions, determine the profit capacity etc.
- However, the capital budgeting decisions deal with future uncertainty, time value of money and problem of measurement of future cashflows.
- Capital budgeting decisions may be classified as (1) Replacement decision, Expansion decision. Diversification decision, Contingent decisions or (2) Mutually exclusive decision or Accept-reject decision.
- In any Capital budgeting decision, there are 3 steps : (*i*) Estimation of costs and benefits of a proposal, (2) Estimation of required rate of return and (3) Using techniques of capital budgeting and selection of a proposal.
- In Capital budgeting, the costs and benefits of a proposal are measured in terms of cash flows, and not the accounting profits (because accounting profits are affected by the discretionary accounting policies).
- The cashflows relating to a proposal may be classified as (*a*) Initial cash outflows (*b*) Subsequent cash inflows and outflows and (*c*) Terminal cash inflows.
- All cash flows are calculated on After-Tax basis.
- In Capital budgeting, only relevant cashflows are considered. Sunk cost, for example, is irrelevant and hence ignored.
- The cash flows are considered on after tax basis and financial cashflows relating to raising of finance for the proposal are ignored.
- Similarly, allocated overheads are considered as irrelevant and hence ignored in capital budgeting decision process. Opportunity cost is a relevant cost and is considered in calculation of cash flows.
- There are several principles to be followed in calculation of cash flows.

GRADED ILLUSTRATIONS

Illustration 3.1

RST Ltd. is planning to instal a new machine costing ₹ 15,00,000 with a salvage value of ₹ 1,00,000 after 5 years of life. Following information is available in respect of the machine :

Annual Production : 1,00,000 Units for year 1 and to increase by 10,000 units p.a. over immediate preceding year production for next 4 years.

Selling Price : ₹ 15 per unit

Variable cost : ₹ 10 per unit

Fixed cost : ₹ 2,00,000 p.a.

Tax rate : 30%

Depreciation : 20% on Written Down Value

Find out Initial, Subsequent and Terminal cash flows from the machine.

Solution :

Initial Outflow :

Cost ₹ 15,00,000

Subsequent Annual Inflows :

	Year 1	Year 2	Year 3	Year 4	Year 5
Sales (in Units)	1,00,000	1,10,000	1,20,000	1,30,000	1,40,000
Selling price (per unit)	₹ 16	₹ 16	₹ 16	₹ 16	₹ 16
Total Sales (₹)	16,00,000	17,60,000	19,20,000	20,80,000	22,40,000
– Variable Cost @ ₹ 10	10,00,000	11,00,000	12,00,000	13,00,000	14,00,000
– Fixed Cost	2,00,000	2,00,000	2,00,000	2,00,000	2,00,000
– Depreciation	3,00,000	2,40,000	1,92,000	1,53,600	1,22,880
Profit before tax	1,00,000	2,20,000	3,28,000	4,26,400	5,17,120
– Tax @ 30%	30,000	66,000	98,400	1,27,920	1,55,136
Profit after Tax	70,000	1, 54,000	2,29,600	2,98,480	3,61,984
Depreciation	3,00,000	2,40,000	1,92,000	1,53,600	1,22,880
Annual Cash Inflows	3,70,000	3,94,000	4,21,600	4,52,080	4,84,864

Terminal Inflows:

Salvage Value (A)		₹ 1,00,000
Capital Loss: Book Value	4,91,520	
Salvage Value	1,00,000	
Tax Saving @ 30%	1,17,456	1,17,456
Net Inflow		2,17, 456

Illustration 3.2

X Ltd. is planning to purchase a machine for ₹ 1,50,000 which is likely to bring following earnings in the next five years :

Years	1	2	3	4	5
Earnings (₹)	50,000	55,000	60,000	62,000	65,000

The purchase of machine will result in increase of working capital by ₹ 15,000. The machine will be depreciated on SLM basis and has salvage value of ₹ 25,000. The company is subject to tax at the rate of 30 per cent.

Solution:

Initial Outflow:

Cost of Machine	₹ 1,50,000	
Increase in Working Capital	15,000	₹ 1,65,000

Subsequent Annual Inflows : **(Fig. in ₹)**

Year	*Earnings*	*Dep.*	*PBT*	*Tax @ 30%*	*PAT*	*CF*
1	50,000	25,000	25,000	7,500	17,500	42,500
2	55,000	25,000	30,000	9,000	21,000	46,000
3	60,000	25,000	35,000	10,500	24,500	49,500
4	62,000	25,000	37,000	11,100	25,900	50,900
5	65,000	25,000	40,000	12,000	28,000	53,000

Terminal Inflow :

Working Capital	₹ 15,000
Salvage Value	25,000
	40,000

Illustration 3.3

NIRC Ltd. in considering an investment proposal for which the relevant information is as follows :

Purchase price of the new asset	₹ 10,00,000
Installation costs	2,00,000
Increase in working capital in year zero	2,50,000
Scrap value of the new asset after 4 years	3,50,000
Revenues from new asset (Annual)	21,50,000

Cash expenses on new asset (Annual)	9,50,000
Current Book value (old asset)	4,00,000
Present scrap value (old asset)	5,00,000
Revenue from old asset (Annual)	19,25,000
Cash expenses on old asset (Annual)	11,25,000

Planning period, 4 years.

Depreciation on new asset : 92% the cost is to be depreciated in the ratio of 5 : 8 : 6 : 4 over 4 years.

Existing asset is depreciated at a rate of ₹ 1,00,000 p.a.

Tax rate is 40% on both revenues as well as capital gains/losses.

Solution :

Initial Cash outflow :

Purchase price	₹ 10,00,000
+ Installation Cost	2,00,000
+ Working Capital increase	2,50,000
– Scrap value of old asset	5,00,000
+ Tax on gain on sale of old asset	40,000
(40% of ₹ 1,00,000)	9,90,000

Subsequent Cash flow (Annual) :

New Machine	Year 1 ₹	Year 2 ₹	Year 3 ₹	Year 4 ₹
Annual Revenue	21,50,000	21,50,000	21,50,000	21,50,000
Cash expense	9,50,000	9,50,000	9,50,000	9,50,000
Profit before dep.	12,00,000	12,00,000	12,00,000	12,00,000
– Depreciation	2,40,000	3,84,000	2,88,000	1,92,000
Profit before tax	9,60,000	8,16,000	9,12,000	10,08,000
–Tax @ 40%	3,84,000	3,26,400	3,64,800	4,03,200
Profit after Tax	5,76,000	4,89,600	5,47,200	6,04,800
Dep. (added back)	2,40,000	3,84,000	2,88,000	1,92,000
Annual Cash Flow	8,16,000	8,73,600	8,35,200	7,96,800
– Cash flow (old asset)	5,20,000	5,20,000	5,20,000	5,20,000
Incremental cash flows	2,96,000	3,53,600	3,15,200	2,76,800

The annual cash flow of old machine can be calculated as follows :

Annual revenue	₹ 19,25,000
- Cash expenses	11,25,000
- Depreciation	1,00,000
Profit before tax	7,00,000
- Tax @ 40%	2,80,000
Profit after tax	4,20,000
Depreciation (added back)	1,00,000
Therefore, annual cash inflow	5,20,000

The depreciation on new asset has been calculated as follows:

(₹ 10,00,000 + ₹ 2,00,000) × 92% = ₹ 11,04,000. This amount of ₹ 11,04,000 is to be depreciated over next 4 years in the ratio of 5 : 8 : 6 : 4 *i.e.,* ₹ 2,40,000, ₹ 3,84,000, ₹ 2,88,000 and ₹ 1,92,000. The depreciation on the old asset is ₹ 1,00,000 p.a. *i.e.,* ₹ 4,00,000/4.

Terminal Cash flow:

Salvage Value (A)	₹ 3,50,000
– Book Value (8% of ₹ 12,00,000)	96,000
Gain on Sale	2,54,000
Tax @ 40%(B)	1,01,600
Net cash inflow (A–B)	2,48,400
+ Working Capital released	2,50,000
Total	4,98,400

In addition to this terminal cash flow of ₹ 4,98,400, there will be annual incremental cash inflow of ₹ 2,76,800 also in the last year. Therefore, the total inflow in the last year will be ₹ 7,75,200.

Illustration 3.4

XYZ is interested in assessing the cash flows associated with the replacement of an old machine by a new machine. The old machine bought a few years ago has a book value of ₹ 90,000 and it can be sold for ₹ 90,000. It has a remaining life of five years after which its salvage value is expected to be *nil.* It is being depreciated annually at the rate of 20 per cent (written down value method.)

The new machine costs ₹ 4,00,000. It is expected to fetch ₹ 2,50,000 after five years when it will no longer be required. It will be depreciated annually at the rate of $33^{1}/_{3}$ per cent (written down value method.) The new machine is expected to bring a saving of ₹ 1,00,000 in manufacturing costs. Investment in working capital would remain unaffected. The tax rate applicable to the firm is 30 per cent. Find out the relevant cash flow for this replacement decision. (Tax on capital gain/loss to be ignored).

Solution :

Initial Cash Flow :	**Amount**
Cost of new machine	₹ 4,00,000
– Salvage value of old machine	90,000
	3,10,000

Subsequent annual Cash Flows:

(Amount ₹ '000)

	Yr. 1	Yr. 2	Yr.3	Yr.4	Yr.5
Savings in costs (A)	100	100	100	100	100
Depreciation on new machine	133.3	88.9	59.3	39.5	26.3
–Depreciation on old machine	18.0	14.4	11.5	9.2	7.4
Therefore, Incremental depreciation (B)	115.3	74.5	47.8	30.3	18.9
Net Incremental saving (A – B)	–15.3	25.5	52.2	69.7	81.1
Less: Incremental Tax @ 30%	–4.6	7.8	15.7	24.9	24.3
Incremental Profit	–10.7	17.7	36.5	44.8	56.8
Depreciation (added back)	115.3	74.5	47.8	30.3	18.9
Net cash flow	104.6	92.2	84.3	75.1	75.7

Terminal Cash Flow : There will be a cash inflow of ₹ 2,50,000 at the end of 5th year when the new machine will be

scrapped away. So, in the last year the total cash inflow will be ₹ 3,25,700 (*i.e.*, ₹ 2,50,000 + ₹ 75,700).

Illustration 3.5

XYZ Ltd. is trying to decide whether it should replace a manually operated machine with a fully automatic version of the same machine. The existing machine, purchased ten years ago, has a book value of ₹ 1,40,000 and remaining life of 10 years. Salvage value is ₹ 40,000. The machine has recently begun causing problems with breakdowns and is costing the company ₹ 20,000 per year in maintenance expenses. The company has been offered ₹ 1,00,000 for the old machine as a trade-in on the automatic model which has a delivery price (before allowance for trade-in) of ₹ 2,20,000. It is expected to have a ten-year life and a salvage value of ₹ 20,000. The new machine will require installation modifications costing ₹ 40,000 to the existing facilities, but it is estimated to have a cost savings in materials of ₹ 80,000 per year. Maintenance costs are included in the purchase contract and are borne by the machine manufacturer. The tax rate is 30% (applicable to both revenue income as well as capital gains/losses). Straight line depreciation over ten years will be used. Find out the relevant cash flows.

Solution :

Initial Cash Outflow:

Cost of new machine	₹ 2,20,000	
+ Initial expenses	40,000	
	2,60,000	
– Trade-in	1,00,000	
	1,60,000	
–Tax savings @ 30% of (1,40,000 – 1,00,000)	12,000	₹ 1,48,000
Subsequent cash flows:		
Cost reduction (savings)	80,000	
+ Repairs (not required)	20,000	1,00,000
Depreciation on new machine (2,20,000+40,000-20,000)/10	24,000	
Depreciation on old machine (1,40,000 – 40,000)/10	10,000	
Therefore, incremental dep.		14,000
Net savings		86,000
Tax @ 30%		25,800
Savings after tax		60,200
Depreciation (added back)		14,000
Annual cash inflow		74,200

Terminal Cash Flow : There will be a sacrifice of ₹ 40,000 at the end of 10th year from the old machinery. There will be a cash inflow of ₹ 20,000 at the end of 10th year when the new machine will be scrapped away. So, in the last year the total cash inflow will be ₹ 54,200 (*i.e.*, ₹ –40,000 + ₹ 20,000 + ₹ 74,200).

Illustration 3.6

ABC & Co. is considering a proposal to replace one of its plants costing ₹ 60,000 and having a written down value of ₹ 24,000. The remaining economic life of the plant is 4 years after which it will have no salvage value. However, if sold today, it has a salvage value of ₹ 20,000. The new machine costing ₹ 1,30,000 is also expected to have a life of 4 years with a scrap value of ₹ 18,000. The new machine, due to its technological superiority, is expected to contribute additional annual benefit (before depreciation and tax) of ₹ 60,000. Find out the cash flows associated with this decision given that the tax rate applicable to the firm is 30%. (The capital gain or loss may be taken as not subject to tax.)

Solution :

1. **Initial Cash outflow :**

Cost of new machine		₹ 1,30,000
– Scrap value of old machine		20,000
		1,10,000

2. **Subsequent Cash inflows (annual)**

Incremental benefit		60,000
– Incremental Depreciation		
Dep. on new machine	28,000	
Dep. on old machine	6,000	22,000
Profit before tax		38,000
– Tax @ 30%		11,400
Profit after tax		26,600
+ Depreciation (added back)		22,000
Annual cash inflow		48,600

The amount of depreciation of ₹ 28,000 on the new machine is ascertained as follows: (₹ 1,30,000 – ₹ 18,000)/4 = ₹ 28,000. It may be noted that in the given situation, the benefits are given in the incremental form *i.e.*, the additional benefits contributed by the proposal. Therefore, only the incremental depreciation of ₹ 22,000 has been deducted to find out the taxable profits.

3. **Terminal Cash inflow :** There will be an additional cash inflow of ₹ 18,000 at the end of 4th year when the new machine will be scrapped away. Therefore, total inflow of the last year would be ₹ 66,600 (*i.e.*, ₹ 48,600 + ₹ 18,000).

Illustration 3.7

A firm is currently using a machine which was purchased two years ago for ₹ 70,000 and has a remaining useful life of 5 years.

It is considering to replace the machine with a new one which will cost ₹ 1,40,000. The cost of installation will amount to ₹ 10,000. The increase in working capital will be ₹ 20,000. The expected cash inflows before depreciation and taxes for both the machines are as follows :

Year	Existing Machine	New Machine
1.	₹ 30,000	₹ 50,000
2.	30,000	60,000
3.	30,000	70,000
4.	30,000	90,000,
5.	30,000	1,00,000

The firm uses StraightLine Method of depreciation. The average tax on income as well as on capital gains/losses is 30%.

Calculate the incremental cash flows assuming sale value of existing machine : (*i*) ₹ 80,000, (*ii*) ₹ 60,000, (*iii*) ₹ 50,000 and (*iv*) ₹ 30,000.

Solution :

Incremental Initial Cash outflow : **(Figures in ₹)**

	Different Cases of Scrap Values			
Cost of new machine	1,40,000	1,40,000	1,40,000	1,40,000
+ Installation Cost	10,000	10,000	10,000	10,000
+ Additional Working Capital	20,000	20,000	20,000	20,000
– Scrap Value	80,000	60,000	50,000	30,000
	90,000	1,10,000	1,20,000	1,40,000
Tax liability/saving	9,000	3,000	—	–6,000
Cash outflow	99,000	1,07,000	1,20,000	1,34,000

Calculation of tax paid/saved:

Book value of Old Plant	50,000	50,000	50,000	50,000
– Scrap value	80,000	60,000	50,000	30,000
Profit/Loss	30,000	10,000	—	(20,000)
Tax @ 30% on capital gain/loss	9,000	3,000	—	–6,000

Subsequent Cash inflows (Annual)

(Figures in ₹)

	Year 1	Year 2	Year 3	Year 4	Year 5
Cash inflows					
On New Machine	50,000	60,000	70,000	90,000	1,00,000
On Old Machine	30,000	30,000	30,000	30,000	30,000
Incremental Cash inflow	20,000	30,000	40,000	60,000	70,000
– Incremental depreciation	20,000	20,000	20,000	20,000	20,000
Profit before Tax	—	10,000	20,000	40,000	50,000
– Tax at 30%	—	3,000	6,000	12,000	15,000
Profit after Tax	—	7,000	14,000	28,000	35,000
Depreciation (added back)	20,000	20,000	20,000	20,000	20,000
Net Cash Inflow	20,000	27,000	34,000	48,000	55,000

The amount of incremental depreciation has been calculated as follows :

Depreciation on New Machine = (₹ 1,40,000 + ₹ 10,000)/5
= ₹ 30,000

Depreciation on Old Machine = ₹ 70,000/7
= ₹ 10,000

Therefore, Incremental depreciation = ₹ 20,000

Terminal Cash Flow : There will be a terminal cash flow of ₹ 20,000 at the end of 5th year in the form of working capital released.

Illustration 3.8 (Block of Assets Method)

Kalyani Black Carbon Ltd. is considering an expansion plan.If the plan is approved, it will give the company, an opportunity to reorganise its stores department which is expected to reduce the annual operating cost by ₹ 40,000 over next 5 years. However, this plan will cause the company to modify its replacement plans. Consequently, the expenditure plans of ₹ 1,50,000 p.a. for year 3 and 5 will have to increase to ₹ 1,90,000 p.a. and reschedule to occur in year 1 and 4. All other plans will remain unaffected. Find out the relevant cashflows for the expansion plan in respect of the above for first 5 years given that the tax rate is 30% and depreciation is provided as per SL method (life 5 years).

Solution : **(Figures in ₹)**

	Year 1	Year 2	Year 3	Year 4	Year 5
Savings in Operating Cost	40,000	40,000	40,000	40,000	40,000
Less Tax @ 30%	–12,000	–12,000	–12,000	–12,000	–12,000
Net Savings	38,000	38,000	38,000	38,000	38,000
+ Planned Expenditure not required	—	—	1,50,000	—	1,50,000
– Expenditure now required	–1,90,000	—	—	–1,90,000	—
Cashflows (A)	–1,52,000	38,000	1,88,000	–1,52,000	1,88,000
Depreciation for Planned Expenditure	—	—	30,000	30,000	60,000
Tax Saving @ 30% (B)	—	—	9,000	9,000	18,000
Depreciation for New Expenditure	38,000	38,000	38,000	76,000	76,000
Tax savings @ 30% (C)	11,400	11,400	11,400	22,800	22,800
Incremental Tax Savings (C–B)	11,400	11,400	2,400	13,800	4,800
Net Cashflows A+ (C–B)	–1,40,600	49,400	1,90,400	–1,38,200	1,92,800

OBJECTIVE TYPE QUESTIONS

State whether each of the following statements is ***True (T)*** *or* ***False (F)****.*

(*i*) Investment decisions and capital budgeting are same.

(*ii*) Capital budgeting decisions are long term decisions.

(*iii*) Capital budgeting decisions are reversible in nature.

(*iv*) Capital budgeting decisions do not affect the future profitability of the firm.

(*v*) There is a time element involved in capital budgeting.

(*vi*) An expansion decision is not a capital budgeting decision.

(*vii*) In mutually exclusive decision situation, the firm can accept all feasible proposals.

(*viii*) Capital budgeting and capital rationing are alternative to each other.

(*ix*) Correct capital budgeting decisions can be taken by comparing the cost with future benefits.

(*x*) Future expected profits from an investments are taken as returns from the investment for capital budgeting.

(*xi*) Cash flows are the appropriate measure of costs and benefits from an investment proposal.

(*xii*) Sunk cost is a relevant cost in capital budgeting.

(*xiii*) The opportunity cost of an input is always considered, in capital budgeting.

(*xiv*) Allocated overhead costs are not relevant for capital budgeting.

(*xv*) Cash flows and accounting profits are different.

[**Answers :** *(i) F, (ii) T, (iii) F, (iv) F, (v) T, (vi) F, (vii) F, (viii) F, (ix) F, (x) F, (xi) T, (xii) F, (xiii) F, (xiv) T, (xv) T*]

MULTIPLE CHOICE QUESTIONS

1. Capital Budgeting is a part of :
- (*a*) Investment Decision,
- (*b*) Working Capital Management,
- (*c*) Marketing Management,
- (*d*) Capital Structure.

2. Capital Budgeting deals with :
- (*a*) Long-term Decisions,
- (*b*) Short-term Decisions,
- (*c*) Both (a) and (b),
- (*d*) Neither (a) nor (b).

3. Which of the following is not used in Capital Budgeting ?
- (*a*) Time Value of Money,
- (*b*) Sensitivity Analysis,
- (*c*) Net Assets Method,
- (*d*) Cash Flows.

4. Capital Budgeting Decisions are :
- (*a*) Reversible,
- (*b*) Irreversible.
- (*c*) Unimportant,
- (*d*) All of the above.

5. Which of the following is not incorporated in Capital Budgeting ?
- (*a*) Tax-Effect,
- (*b*) Time Value of Money,
- (*c*) Required Rate of Return,
- (*d*) Rate of Cash Discount.

6. Which of the following is not a capital budgeting decision ?
- (*a*) Expansion Programme,
- (*b*) Merger,
- (*c*) Replacement of an Asset,
- (*d*) Inventory Level.

7. A sound Capital Budgeting technique is based on :
- (*a*) Cash Flows,
- (*b*) Accounting Profit,
- (*c*) Interest Rate on Borrowings,
- (*d*) Last Dividend Paid.

8. Which of the following is not a relevant cost in Capital Budgeting ?
- (*a*) Sunk Cost,
- (*b*) Opportunity Cost,
- (*c*) Allocated Overheads,
- (*d*) Both (a) and (c) above.

9. Capital Budgeting Decisions are based on :
- (*a*) Incremental Profit,
- (*b*) Incremental Cash Flows,
- (*c*) Incremental Assets,
- (*d*) Incremental Capital.

10. Which of the following does not effect cash flows from a proposal :
- (*a*) Salvage Value,
- (*b*) Depreciation Amount,
- (*c*) Tax Rate Change,
- (*d*) Method of Project Financing.

11. Cash Inflows from a project include :
- (*a*) Tax Shield of Depreciation,
- (*b*) After-tax Operating Profits,
- (*c*) Raising of Funds,
- (*d*) Both (a) and (b).

12. Which of the following is not true with reference to capital budgeting ?
- (*a*) Capital budgeting is related to asset replacement decisions,
- (*b*) Cost of capital is equal to minimum required rate of return,
- (*c*) Existing investment in a project is not treated as sunk cost,
- (*d*) Timing of cash flows is relevant.

13. Which of the following is not followed in capital budgeting ?
- (*a*) Cash flows Principle,
- (*b*) Interest Exclusion Principle,
- (*c*) Accrual Principle,
- (*d*) Post-tax Principle.

14. Depreciation is incorporated in cash flows because it :
- (*a*) Is unavoidable cost,

(*b*) Is a cash flow,

(*c*) Reduces Tax liability,

(*d*) Involves an outflow.

15. Which of the following is not true for capital budgeting ?

(*a*) Sunk costs are ignored,

(*b*) Opportunity costs are excluded,

(*c*) Incremental cash flows are considered,

(*d*) Relevant cash flows are considered.

16. Which of the following is not applied in capital budgeting ?

(*a*) Cash flows be calculated in incremental terms,

(*b*) All costs and benefits are measured on cash basis,

(*c*) All accrued costs and revenues be incorporated,

(*d*) All benefits are measured on after-tax basis.

17. Evaluation of Capital Budgeting Proposals is based on Cash Flows because :

(*a*) Cash Flows are easy to calculate,

(*b*) Cash Flows are suggested by SEBI,

(*c*) Cash is more important than profit,

(*d*) None of the above.

18. Which of the following is not included in incremental cash flows ?

(*a*) Opportunity Costs,

(*b*) Sunk Costs,

(*c*) Change in Working Capital,

(*d*) Inflation effect.

19. A proposal is not a Capital Budgeting proposal if it :

(*a*) is related to Fixed Assets,

(*b*) brings long-term benefits,

(*c*) brings short-term benefits only,

(*d*) has very large investment.

20. In Capital Budgeting, Sunk cost is excluded because it is :

(*a*) of small amount,

(*b*) not incremental,

(*c*) not reversible,

(*d*) All of the above.

[**Answers :** *1(a), 2(a), 3(c), 4(b), 5(d), 6(d), 7(a), 8(d), 9(b), 10(d), 11(d), 12(c), 13(c), 14(c), 15(b), 16(c), 17(c), 18(b), 19(c), 20(b)*].

ASSIGNMENTS

1. Write short notes on :

(*a*) Opportunity cost with reference to a capital budgeting situation.

(*b*) Conventional cash flows.

(*c*) Allocated Overheads.

(*d*) Sunk Cost

2. What are the important steps in capital budgeting?

3. What is capital budgeting? Why is it significant for a firm? *[B.Com. (H), D.U., 2018]*

4. What do you mean by mutually exclusive projects? How do they differ from accept-reject projects?

5. Examine the effects of depreciation policy on the cash flows of a firm. How does depreciation affect the cash flows of a proposal?

6. What are different types of cash flows associated with capital budgeting process? Why are they taken after tax?

7. Define cash flows. How is it different from profit? Explain the superiority of cash flows in investment decision making. *[B.Com. (H), D.U., 2016]*

8. What do you mean by incremental cash flows? Explain the treatment of sunk cost and allocated overheads in cash flows.

9. What are the distinct categories of investment decisions. Discuss the basic factors on which capital budgeting decisions depend.

10. How would you deal 'Sunk cost' and 'Allocated overheads' in analyzing investment decisions?

11. What adjustments are required to convert accounting profits into cash inflows? Explain the rationale for this adjustment.

12. The cash flow approach of measuring future benefits of a project is superior to the accounting approach. Discuss.

PROBLEMS

P3.1 ABC Instruments Ltd. is considering the purchase of a machine to replace an existing machine that has a book value of ₹ 24,000, and can be sold for ₹ 12,000. The salvage value of the old machine in four years is zero, and it is depreciated on a straight-line basis. The proposed machine will perform the same function the old machine is performing; however improvements in technology will enable the firm to reap cash benefits (before depreciation and taxes) of ₹ 56,000 per year in materials, labour, and overhead. The new machine has a four year life, costs ₹ 1,12,000 and can be sold for an expected ₹ 16,000 at the end of the fourth year. Assuming straight-line depreciation and a 30% tax rate, compute cash flows associated with this replacement.

[*Answer :* Initial Outlay : ₹ 96,400; Yearly incremental inflows are ₹ 44,600 per annum; The terminal cost inflow is ₹ 16,000.]

P3.2 A company is faced with the problem of choosing between two mutually exclusive projects. Project A requires a cash outlay of ₹ 1,00,000 and cash running expenses of ₹ 35,000 per year. On the other hand, Project B will cost ₹ 1,50,000 and requires cash running expenses of ₹ 20,000 per year. Both the machines have a eight-year life. Project A has a ₹ 4,000 salvage value and Project B has ₹ 14,000 salvage value. The company's tax rate is 30% and has a 10% required rate of return. Assume depreciation on straight-line basis and no tax on salvage values of assets. Find out the Initial, Annual and Terminal cash flows on incremental basis.

[*Answer :* Initial Outflow ₹ 50,000; Annual inflows ₹ 12,000 per annum; and Terminal cash inflow is ₹ 10,000.]

P3.3 ABC Company is having difficulties with an automated machine having 4 years of service life, its operating costs are fairly sizable compared to its revenues. For the next four years, the revenues generated will be ₹ 5,20,000 annually and the annual cost expenses will be ₹ 3,80,000. In addition, it must take depreciation of ₹ 80,000 per year until the machine reaches zero book value. The machine could be sold today for net cash of ₹ 80,000 which is less than its current book value of ₹ 1,60,000. The firm's alternative is to invest in a new machine costing ₹ 4,00,000 and ₹ 80,000 installation expenses. The new machine would generate a revenue of ₹ 9,20,000 and cash expense of ₹ 5,80,000. It would be depreciated over a 4-year period to a book value of ₹ 1,60,000 at which time it could be sold for ₹ 1,40,000 net cash. Depreciation would be provided as per straight-line and it requires additional ₹ 2,00,000 of inventory and receivables over the 4-year period. What is the differential after tax cash flows stream for this proposal? (Tax rate may be taken at 30% for both revenue & capital profits/losses)

[*Answer :* Initial outflow is ₹ 5,76,000. Annual incremental inflows are ₹ 1,40,000, 1,40,000, 1,64,000 and ₹ 1,64,000. The terminal cash inflow is ₹ 3,50,000.]

P3.4 A cosmetic company is considering to introduce a new lotion. The manufacturing equipment will cost ₹ 5,60,000. The expected life of the equipment is 8 years. The company is thinking of selling the lotion at ₹ 12 each pack. It is estimated that variable cost per pack would be ₹ 6 and annual fixed cost ₹ 4,50,000. Fixed cost includes (straight-line) depreciation of ₹ 70,000 and allocated overheads of ₹ 30,000. The company expects to sell 1,00,000 packs of the lotion each year. Assume that tax is 30% and straight-line depreciation is allowed for tax purpose. Calculate the cash flows.

[*Answer :* Annual cash inflows are ₹ 1,96,000 and Initial cash outflow is ₹ 5,60,000.]

CHAPTER

4

Capital Budgeting : Techniques of Evaluation

"How does a firm's management decide what to invest in? The firm's very survival depends upon management's ability to conceive, analyze and select investment opportunities that are profitable. Further, management's own survival may depend upon selecting those projects which best maximize the firm's objectives under the constraints of the shareholders wishes and governmental edicts. Obviously, once management has decided on a corporate goal, it needs some general rules which can be applied to help make decisions on individual project proposals."[1]

SYNOPSIS

- Techniques of Evaluation.
- Traditional Techniques.
  - Payback Period.
  - Accounting Rate of Return.
- Discounted Cash Flow Techniques.
  - Discounting Procedure.
  - Net Present Value Technique.
  - Profitability Index Method.
  - Discounted Payback Period Method.
  - Internal Rate of Return.
  - NPV *versus* IRR.
  - Modified International Rate of Return.
- Capital Budgeting Decisions : Some Cases.
  - Accept-Reject Decisions.
  - Replacement Decisions.
  - Mutually Exclusive Proposals.
- Reinvestment Rate Assumption.
- Capital Budgeting Proposals with Unequal lives of Proposals.
- Risk Analysis in Capital Budgeting.
  - Risk-Adjusted Discount Rate.
  - Certainty - Equivalent Method.
- Selecting an Appropriate Technique.
- Graded Illustrations in Capital Budgeting.

1. Bolten S.E., *Managerial Finance,* Houghton Mifflin Company, Bosten, 1996, p.146.

Capital budgeting decision process involves three steps *i.e.*, (*i*) estimation of cost and benefits of a proposal, (*ii*) estimation of required rate of return, and (*iii*) evaluation of different proposals in order to select one. Out of these steps, the first step *i.e.*, estimation of cash flows associated with the proposal has already been discussed at length in the previous chapter. The second step *i.e.*, the determination of the required rate of return will be taken up in Chapter 5. The present chapter looks into various techniques available for the evaluation of different investment proposals.

The capital budgeting decision process starts with the estimation and determination of cost and benefits associated with different proposals. As already noted that these cost and benefits are expressed in terms of cash flows arising out of a proposal. After the ascertainment of these cash flows, the different proposals are to be evaluated in order to select the best proposal for the firm. The finance manager at this stage is faced with the questions like 'Is the proposal worthwhile' ? 'Should it be accepted' ? 'Is it going to be beneficial for the firm' ? And many others. Any attempt by a finance manager to answer these question must be made in the light of the objective of maximization of shareholders wealth.

There are different techniques available to evaluate different alternative proposals. Each of these techniques has its own specific methodology and acceptance criterion. These techniques have been discussed in the following sections. However, the discussion of different techniques presupposes : (*i*) That the relevant cash flows are known with certainty and (*ii*) That there is no constraint of funds available with the firm.

EVALUATION OF PROPOSALS : THE BACKGROUND

Investment analysis is arguably, the most important part of corporate financial analysis. Allocating scarce resources among competing uses requires a mechanism or decision rule that separates those investments that are worth making from those that are not. While evaluating different proposals, the finance manager in the first instance is concerned with the selection of criterion or the yardstick which he will apply to find out the worthwhileness of a proposal.

The different proposals should be evaluated in terms of their economic worth to the firm. The economic worth can be measured in terms of cost and benefits of the proposals to the firm. Cost and benefits of a proposals are measured in terms of cash flows generated by it. A Capital budgeting technique to be used by a firm should be one which is capable of evaluating different proposals on the basis of cash flows generated by it. Following are some of the features which a capital budgeting evaluation technique should possess :

1. The criterion must be able to incorporate all the cash flows associated with the proposal.
2. It should also incorporate the time value of money *i.e.*, the cash flows arising at different point of time must be differentiated in respect of their worth to the firm.
3. It should be capable of ranking different proposals in order of their worth to the firm.
4. It should be objective and unambiguous in its approach. There should not be any scope for subjectivity of the decision maker.
5. The last but not the least, the technique must be in line with the objective of maximization of shareholders wealth.

CAPITAL BUDGETING : TECHNIQUES OF EVALUATION

The attractiveness of any investment proposal depends on the following elements (*i*) the amount expended *i.e.*, the net investment, (*ii*) the potential benefits *i.e.*, the operating cash inflows, and (*iii*) the time period over which these benefits will accrue *i.e.*, economic life of the project. A proper investment analysis must relate these three elements to provide an indication of whether the investment is worthy of being taken up or not. How do these three basic elements *i.e.*, the net investment, the operating cash flows and the economic life can be related to determine the proposal's worthiness ? There are different techniques available for evaluation and selection of a proposal. These techniques can be grouped into two categories as presented in Figure 4.1.

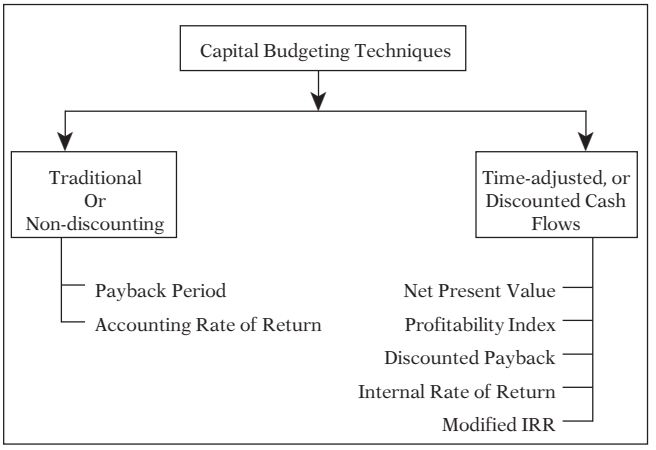

FIGURE 4.1: TECHNIQUES OF CAPITAL BUDGETING

TRADITIONAL OR NON-DISCOUNTING TECHNIQUES

As the name itself suggests, these techniques do not discount the cash flows to find out their present worth. There are two such techniques available *i.e.*, (*i*) the Payback period method, and (*ii*) the Accounting rate of return. These are essentially rules of thumb that intuitively grapple with the trade-off between net investment and operating cash inflows. Both these traditional evaluation criteria have been discussed as follows :

Payback Period

The payback period is defined as the number of years required for the proposal's cumulative cash inflows to be equal to its cash outflows. In other words, the payback period is the length of time required to recover the initial cost of the project. The payback period therefore, can be looked upon as the length of time required for a proposal to 'break even' on its net investment.

Computation of the Payback Period : The payback period can be calculated in two different situations :

(*a*) ***When annual inflows are equal :*** When the cash inflows being generated by a proposal are equal per time period *i.e.,* the cash inflows are in the form of an annuity, the payback period can be computed by dividing the cash outflow by the amount of annuity. For example, a proposal requires a cash outflow of ₹ 1,00,000 and is expected to generate cash inflows of ₹ 20,000 p.a. for 6 years. In this case, the payback period is 5 years *i.e.,* ₹ 1,00,000/₹ 20,000. The initial cash outflow of ₹ 1,00,000 will be fully recovered within a period of 5 years and the cash inflows occurring thereafter (*i.e.,* in the 6th year) are ignored. In the above case, if the annual cash inflow is ₹ 30,000 then the payback period lies between 3 years and 4 years and is 3.33 years *i.e.,* ₹ 1,00,000/₹ 30,000.

(*b*) ***When the annual cash inflows are unequal:*** In case the cash inflows from the proposal are not in annuity form then the cumulative cash inflows are used to compute the payback period. For example, a proposal requires a cash outflow of ₹ 20,000 and is expected to generate cash inflows of ₹ 8,000, ₹ 6,000, ₹ 4,000, ₹ 2,000 and ₹ 2,000 over next 5 years respectively. The payback period is 4 years because the sum of cash inflows of first 4 years is ₹ 20,000 (*i.e.,* ₹ 8,000 + ₹ 6,000 + ₹ 4,000 + ₹ 2,000). A measurement problem may occur when the cumulative cash inflows do not exactly equal to proposal's cash outflow. In the same case, if the cash outflow is only ₹ 18,500 then the payback period may be calculated as follows :

Year	Annual CF	Cumulative CF
1	₹ 8,000	₹ 8,000
2	6,000	14,000
3	4,000	18,000
4	2,000	20,000

Now, the required cumulative cash inflows is ₹ 18,500. At the end of 3rd year, the cumulative cash inflows is ₹ 18,000. For the 4th year, the annual cash inflow is ₹ 2,000. Therefore, cash inflow of ₹ 500 only during the 4th year will be sufficient to make the total cumulative cash inflows to be ₹ 18,500. The precise period required to earn a cash inflow of ₹ 500 during 4th year can be calculated (on the assumption that the cash inflows occur evenly throughout the year) by linear interpolation *i.e.* the payback period is 3 years + (₹ 500/₹ 2,000) = 3.25 years or 3 years and 3 months. However, it may be noted that the cash inflows occur at the end of a year only. Therefore, the payback period of 3.25 years may be increased to next full year *i.e.* 4 years.

The Decision Rule : The payback period calculated for a proposal is to be compared with some predetermined target period. If the payback period is more than the target period, then the proposal should be rejected, otherwise it may be accepted. There is no systematic or accepted way of determination of target period and choosing a target period is subject to some arbitrariness on the part of the decision maker. Further, if the different proposals are to be ranked in order of priority, then the proposal with the shortest payback period will be first in the priority list.

Critical Evaluation : Out of all the available capital budgeting technique (some of which are discussed later), the payback period is the easiest to understand and apply. The payback period measures the direct relationship between annual cash inflows from a proposal and the net investment required. This technique has been a popular method of evaluation of capital budgeting proposals merely because of its simplicity. Yet, it is having its own problems and disadvantages. The payback period as a technique of evaluation of capital budgeting proposals can be critically examined in terms of its advantages and disadvantages as follows :

Advantages of Payback Method :

1. The payback period is simple and easy, in concept as well as in its applications. In particular, it can be adopted by a small firm having limited man-power which does not have any special skill to apply other sophisticated techniques.
2. It gives an indication of liquidity. In case a firm is having liquidity problems, then the payback period is a good method to adopt as it emphasizes the earlier cash inflows.
3. In a broader sense, the payback period deals with the risk also. The project with a shorter payback period will be less risky as compared to project with a longer payback period, as the cash inflows which arise further in the future will be less certain and hence more risky. So, the payback period helps in weeding out the risky proposals by assigning lower priority.

Disadvantages of Payback Method :

1. The payback period entirely ignores many of the cash inflows which occur after the payback period. It ignores what happens after the initial investment is recouped.
2. It ignores the timing of the occurrence of the cash flows. It considers the cash flows occurring at different point of time as equal in money worth and ignores the time value of money.
3. The payback period also ignores the salvage value and the total economic life of the project. A project which has substantial salvage value may be ignored (though more profitable it may be otherwise) in favour of a project with higher inflows in earlier years. It is insensitive to the economic life span.
4. The payback period is more a method of capital recovery rather than a measure of profitability of a project. To recover the capital is not enough, of course, because from an economic view point one would hope to earn a profit on the funds while they are invested.

5. The payback period is designed to cover the conventional projects that involve large up-front investment followed by positive operating cash inflows. It breaks down, however, when the investment is spread over time or where there is no initial investment.

Suitability of Payback Method : Despite the shortcomings, the payback period method may be an appropriate method under certain circumstances. For example, in a politically unstable country, the firm may have a primary consideration of recovering the initial cost at the earliest opportunity and thus the payback period may be a suitable technique. Further, the payback period may be suitable if the firm has limited funds available and has no ability or willingness to raise additional funds. In such a case, the firm may wish to undertake those projects which ensure early liquidity/recovery to undertake some other projects.

Accounting Rate of Return or Average Rate of Return (ARR)

The ARR is based on the accounting concept of return on investment or rate of return. The ARR may be defined as the annualized net income earned on the average funds invested in a project. In other words, the annual return of a project is expressed as a percentage of the net investment in the project.

Computation of ARR: Symbolically,

$$\text{ARR} = \frac{\text{Average Annual Profit (after tax)}}{\text{Average Investment in the Project}} \times 100$$

This clearly shows that the ARR is a measure based on the accounting profit rather than the cash flows and is very similar to the measure of rate of return on capital employed, which is generally used to measure the over all profitability of the firm. The calculation of ARR may be further discussed with reference to equal annual profits and unequal annual profits as follows :

Equal Profits : In case the expected profits (after tax) generated by a project are equal for all the years than the annual profit itself is the average profit. So, this annual profit will be compared with the average investment to find out the ARR as follows :

$$\text{ARR} = \frac{\text{Annual Profit (after tax)}}{\text{Average Investment in the Project}} \times 100$$

Unequal Profits : If the project is expected to generate unequal profits or uneven stream of profits over different years , then the ARR may be calculated by finding out the average annual profits (by taking the simple arithmetic mean of profits of different years) and then comparing it with the average investment of the project as follows :

$$\text{ARR} = \frac{\text{Average Annual Profit (after tax)}}{\text{Average Investment in the Project}} \times 100$$

In both the cases, the average investment of the project, which is used as the denominator of the ARR formula, is to be calculated. What is this average investment and how is it to be calculated ?

Average Investment : The average investment refers to the average quantum of funds that remains invested or blocked in the proposal over its economic life. The average investment of a proposal is affected by the method of depreciation, salvage value and the additional working capital required by the proposal. The following two approaches are available to calculate the average investment.

(*i*) ***Initial cash outlay as average investment :*** In this case, the original cost of investment and the installation expenses if any, is taken as the amount invested in the project. For example, a project costing ₹ 10,00,000 is expected to generate after tax profit of ₹ 1,50,000 every year. The ARR for the proposal would be 15% (*i.e.* ₹ 1,50,000/₹ 10,00,000 × 100). Theoretically, this approach of average investment seems to be good but taking the initial cost as the average investment is definitely not correct on logical and technical grounds.

(*ii*) ***Average annual book value after depreciation as average investment :*** In this case, the average annual book value (after depreciation) of the proposal is taken as the average investment of the proposal. The following procedure may be adopted for this. First, find out the opening book values and the closing book values of the project for all the years of its economic life. The difference in the opening and closing values for a particular year will depend upon the amount of depreciation for that year. Second, find out the average book values for all the years by taking the simple arithmetic mean of the opening and closing book values. Third, find out the average of all the yearly averages. This average will be the average investment of the proposal.

Short-cut method to find out the average investment: If the firm provides depreciation as per straight line method then the amount of depreciation for all the year would be same and is equal to (initial cost + installation expenses – salvage value)/number of years. This amount of depreciation will be deducted from the opening book values to find out the closing book values for different years. The average of these opening and closing book values will also decrease gradually every year by the amount of annual depreciation. In such a case, the average investment of the proposal over its economic life can now be calculated as:

Average investment = ½(Initial Cost + Installation Expenses – Salvage value) + Salvage value

It may be noted that in the above equation, the amount of salvage value has been first deducted and later added back. The salvage value has been deducted to find out the annual amount of depreciation. However, this amount of salvage value remains blocked in the proposal and is released only at the end of the economic life of proposal. Therefore, the amount of salvage value has been added back to find out the average investment. For example, ABC Ltd. takes a project costing ₹ 1,20,000 with expected life of 5-years and the salvage value of ₹ 20,000. The average investment of the proposal is :

Average investment = ½(1,20,000 – 20,000) + 20,000
= ₹ 70,000.

The average investment can also be calculated as follows :

Year	Opening BV	Closing BV	Average BV
1	₹ 1,20,000	₹ 1,00,000	₹ 1,10,000
2	1,00,000	80,000	90,000
3	80,000	60,000	70,000
4	60,000	40,000	50,000
5	40,000	20,000	30,000
		Total	3,50,000

Average investment = ₹ 3,50,000/5 = ₹ 70,000.

Additional Working Capital: Some times, the project may also require additional working capital for its smooth operations. Though this additional working capital will be released back, when the proposal will be scrapped and terminated, yet this amount of additional working capital is blocked through out the life of the project. So, this additional working capital entails the investment of funds of the firm and should also be added to the average investment calculated as above. The average investment in any proposal (required to find out the ARR) may therefore, be calculated as follows :

Average investment = ½(Initial Cost + Installation Expenses – Salvage value) + Salvage value + Additional Working Capital

To continue with the above example, the project requires an additional working capital of ₹ 20,000 and is expected to generate annual average profit (after tax) of ₹ 18,000, then the average investment and the ARR can be calculated as follows:

Average investment = ½(1,20,000 – 20,000) + 20,000 + 20,000
= ₹ 90,000.

$$\text{ARR} = \frac{\text{Average Annual Profit (after tax)}}{\text{Average investment in the project}} \times 100$$

$$\text{ARR} = \frac{18,000}{90,000} \times 100 = 20\%$$

The Decision Rule : The ARR calculated as above is compared with the pre-specified rate of return. Obviously, if the ARR is more than the pre-specified rate of return, then the project is likely to be accepted, otherwise not. For example, in the above case the ARR of the proposal has been found to be 20%. In case, the firm requires a rate of return of at least 18%, then this proposal is acceptable. However, if the minimum rate of return of the firm is 22% then this proposal is likely to be rejected. The ARR can also be used to rank various mutually exclusive proposals. The project with the highest ARR will have the top priority while the project with the lowest ARR will be assigned lowest priority.

The Critical Evaluation : The ARR is relatively simple to calculate and easy to apply. The relevant data and information required for its calculation is readily available in the accounting records. However, the ARR has certain limitations and drawbacks when used as a technique of project evaluation as follows :

1. It ignores the time value of money and considers the profit earned in the 1st year as equal to the profits earned in later years.
2. The ARR is based on the accounting profits rather than the cash flows. It has already been noted in the previous chapter that accounting profits are affected by different accounting policies. A sound evaluation technique should be based on the cash flows rather than the accounting profits.
3. The ARR also ignores the life of the proposal. A proposal with a longer life may have the same ARR as another proposal with a shorter life has. On the basis of ARR, both the proposals may be placed at par, but the proposal with a longer life should be preferred over the proposal with a shorter life (as the former proposal will generate the returns for a longer period).
4. The ARR technique also ignores the salvage value of the proposal. In real sense, the salvage value is also a return from the proposal and should be considered.
5. The ARR also fails to recognize the size of the investment required for the project. Particularly, in case of mutually exclusive proposals, the two projects having significantly different initial costs, may have same ARR.

ARR is simple but crude method of evaluation of capital budgeting proposals. As it is based on the accounting profits (and not on the cash flows), it does not help in understanding the contribution of the proposal towards maximization of the wealth of the shareholders. In fact, the ARR lacks much to be a sound technique for evaluation of capital budgeting proposals.

The traditional methods of evaluation, (both the PB and ARR) fail to be sound and efficient techniques. In particular these techniques suffer from (*i*) ignoring the time value of money and (*ii*) non-consideration of total benefits emanating from a proposal. Both these aspects are taken into account by the discounted cash flow techniques of evaluation of capital budgeting proposals.

DISCOUNTED CASH FLOWS OR TIME-ADJUSTED TECHNIQUES

Money has time value - cash flows that occur earlier in time are worth more than cash flows that occur later, differences are accentuated as inflation and interest rate increase. Investment decision techniques based on discounted cash flows not only replace accounting income with cash flows but also explicitly consider the time value of money. The discounted cash flow techniques or the time adjusted cash flow techniques, as against the traditional techniques already discussed, are based upon the fact that the cash flows occurring at different point of time are not having same economic worth. In order to make these cash flows equal in economic worth, these must be discounted with reference to the time gap between different cash flows and a pre-determined discount rate. These methods, which involve the time value of money, more accurately reflect the true economic trade-off and returns. These techniques are also called the present

values techniques and fulfil all the requisites of a good evaluation technique.

All the discounted cash flow techniques, discussed later in detail, have one ingredient in common *i.e.*, that all these technique are based upon the discounting procedure by which the future cash flows are discounted to find out their present economic worth. This discounting procedure has been explained as follows :

Discounting Procedure : A common ingredient to Discounted cash flow techniques

Suppose, a firm is considering a capital budgeting proposal having initial cost of ₹ 1,50,000 (including installation expenses) besides requiring additional working capital of ₹20,000. The project is expected to generate annual cash flows of ₹20,000, ₹50,000, ₹60,000, ₹40,000 and ₹30,000 respectively during next five years. Thereafter the project is expected to be scrapped away for ₹ 25,000. In this case, the initial cost of ₹1,50,000 and the additional working capital of ₹20,000 are to be incurred now *i.e.*, at T_0 and are therefore have been expressed in terms of money of T_0. But the other cash inflows which will occur after 1 year from today *i.e.*, at T_1, after 2 year from today *i.e.*, T_2 etc., are expressed in terms of money of that year in which the cash inflows occur. Intuitively, the cash flow in terms of money of T_0 is not comparable with the cash flows in terms of money of T_1, T_2,....T_5. However, these can be made comparable by converting all these cash flows in terms of money of the same date. Generally, it is done by converting all the future cash flows in terms of money of today *i.e.*, T_0.

Now, in order to convert these cash flows, what is required is the time gap and the discount rate. The time gap is the gap between the present date and the future date when a particular cash flow is expected to occur. This time gap is known together with the cash flow. The other variable, that is the discount rate, is presumed to have been given for the time being. However, this discount rate may be defined as the minimum rate of return which a firm wants to earn on the amount invested in any capital budgeting proposal. The determination of this discount rate, *i.e.*, the minimum rate of return, or the cost of capital, as it is generally known as, will be taken up in detail in Chapter 5.

To continue with the above example, and the discount rate given at 10%, the discounting procedure can be explained on the basis of discussion of time value of money (as discussed in Chapter 2). Table 4.1 gives the methodology of the discounting procedure to find out the present values.

TABLE 4.1: DISCOUNTING PROCEDURE TO FIND OUT THE PRESENT VALUES.

Time	Cash flows (₹)	$PVF_{(10\%, n)}$	Present Values (₹)
T_0	–1,70,000	1.000	–1,70,000
T_1	20,000	.909	18,180
T_2	50,000	.826	41,300
T_3	60,000	.751	45,060
T_4	40,000	.683	27,320
T_5	30,000	.621	18,630
T_5	WC 20,000	.621	12,420
T_5	Salvage 25,000	.621	15,525

The figures given in the present value column in Table 4.1 show the present value of different future cash flows. A few basic points are worth noting here. First, the cash flow at T_0 has been discounted by present value factor 1, as it is already expressed in terms of present money. Second, the PVF gradually declines as the time gap increases. The present values given in the last column are expressed in terms of present money and hence are now comparable.

Based on the above discounting procedure, there are two basic discounted cash flow techniques to evaluate capital budgeting proposals. These are the Net Present Value method and the Internal Rate of Return method. However, there are several variants known as the *Profitability Index*, the *Modified IRR* and *Discounted Payback Period*. All these techniques have been discussed as follows :

Net Present Value (NPV) Method

The NPV of an investment proposal may be defined as the sum of the present values of all the cash inflows less the sum of present values of all the cash outflows associated with a proposal. In other words, the NPV of any proposal, that involves cash inflows and outflow over a period of time, is equal to the net present value of all the cash flows. In case, the cash outflows *i.e.* the investment in the proposal occur only in the beginning at time 0, then NPV may be defined as the sum of the present values of cash inflows less the initial investment.

A rate of discount must be specified and applied to both inflows and outflows in order to find out their present values. This rate of discount should be the rate of return, the investor normally enjoys from investments of similar nature and risk. In effect, it is opportunity rate of return. The rate of discount used to discount the cash flows should reflect the minimum return requirement that will leave the shareholders as well off as before. The rate so employed is the overall cost of capital, which takes into account shareholders expectations, business risk and the leverage.

Calculation of NPV : On the basis of the definition of the NPV, it may be defined as :

$$\begin{aligned} NPV &= \text{Excess of PV of Inflows over PV of Outflows} \\ &= \text{PV of Cash Inflows – PV of Outflows} \\ &= \frac{CF_1}{(1+k)^1} + \frac{CF_2}{(1+k)^2} + \frac{CF_n}{(1+k)^n} - CF_0 \quad (4.1) \\ NPV &= \sum_{i=0}^{n} \frac{CF_i}{(1+k)^i} \end{aligned}$$

where, NPV = Net Present Value,
CF_i = Cash flows occurring at time 0, 1, 2.....n,
k = The discount rate, and
n = Life of the Project in years

In the Equation 4.1, the common factor $1/(1+k)^n$ is in fact the PVF for a particular combination of the rate of discount and the 'n', and is also defined as $PVF_{(r,n)}$. The Equation 4.1 is the basic equation of the NPV, however, it can also be written as Equation 4.2.

$$NPV = \sum_{i=1}^{n} \frac{CF_i}{(1+k)^i} - C_0 \quad (4.2)$$

where C_0 = Initial cost of the proposal at time T_0.

To continue with the above example, the NPV can be calculated as follows :

$$NPV = \frac{CF_0}{(1+k)^0} + \frac{CF_1}{(1+k)^1} + \frac{CF_2}{(1+k)^2} + \frac{CF_n}{(1+k)^n}$$

$$NPV = \frac{-1,70,000}{(1+.10)^0} + \frac{20,000}{(1+.10)^1} + \frac{50,000}{(1+.10)^2} + \frac{60,000}{(1+.10)^3} + \frac{40,000}{(1+.10)^4} + \frac{75,000}{(1+.10)^5}$$

$$= (-1,70,000) + (20,000 \times PVF_{(10,1)}) + (50,000 \times PVF_{(10,2)}) + (60,000 \times PVF_{(10,3)}) + (40,000 \times PVF_{(10,4)}) + (75,000 \times PVF_{(10,5)})$$

The above equation can also be presented as in Table 4.2

TABLE 4.2 : CALCULATION OF THE NET PRESENT VALUE

Time	Cash flows (₹)	$PVF_{(10\%T)}$	Present Values (₹)
T_0	–1,70,000	1.000	–1,70,000
T_1	20,000	.909	18,180
T_2	50,000	.826	41,300
T_3	60,000	.751	45,060
T_4	40,000	.683	27,320
T_5	75,000	.621	46,575
		Total	8,435

The total cash inflow for the year T_5 is ₹ 75,000 (consisting of the annual inflow of ₹ 30,000 + Working capital released of ₹ 20,000 + Salvage value of ₹ 25,000). In the same case, if the total initial cost is taken at ₹ 1,80,000 instead of ₹ 1,70,000, then the NPV of project will be ₹ –1,565. Further, if the initial cost happens to be ₹ 1,61,565, then the NPV will be 0. The above example shows that the NPV of a proposal depends upon, among other factors, the rate of discount which is also known as the minimum required rate of return. In Equations 4.1 and 4.2, this rate of discount, k, appears in the denominator. So, there is an inverse relationship between the rate of return and the NPV value. It means that higher rate of return, lesser would be the NPV and lower the rate of return, higher would be the NPV.

The procedure for calculation of NPV is presented in Figure 4.2.

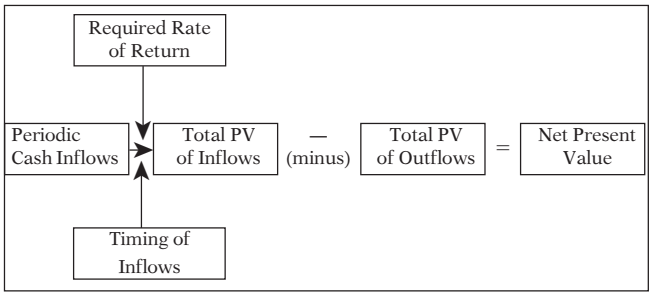

FIGURE 4.2: CALCULATION OF NET PRESENT VALUE

The Decision Rule: The decision rule under the NPV method is :

(*i*) *'Accept the proposal if its NPV is positive and reject the proposal if the NPV is negative'*. The proposals with negative NPV should outrightly be rejected as these entail decrease in the wealth of the shareholders.

(*ii*) In case of Accept-Reject situation, all proposals which have positive NPV are qualified for being accepted.

(*iii*) In case of ranking of mutually exclusive proposals, the proposal with the highest positive NPV is given the top priority and the proposal with the lowest positive NPV is assigned the lowest priority.

(*iv*) However, if the NPV is the proposal is 0, than the firm may be indifferent between acceptance and rejection of the proposal.

The Critical Evaluation : The NPV as a technique of evaluation of capital budgeting proposals helps a finance manager. If the firm invests its funds in those proposals whose NPV is either 0 or negative, then the proposal is not going to contribute anything to the wealth of the shareholders. Rather, it may even decrease the wealth. As the present value depends on both timing and the rate of discount, a positive NPV indicates that over its economic life, the cash flows generated by the investment will recover the original outlay, earn the desired return, and in addition provide a cushion of excess value. Conversely, a negative NPV indicates that the project is not achieving the rate of return and will this cause a loss. Obviously, the rate of return, the timing of the cash flows and the relative magnitude of cash flows will all affect the NPV. The merits of the NPV technique can be enumerated as follows :

1. The first and the foremost merit of the NPV technique is that it recognizes the time value of money. It helps evaluation of proposals involving cash flows over a period of several years.
2. The NPV technique considers the entire cash flow stream and all the cash inflows and outflows, irrespective of the timing of their occurrence, are incorporated in the calculation of the NPV.
3. The NPV technique is based on the cash flows rather than the accounting profit and thus helps in analyzing the effect of the proposal on the wealth of the shareholders in a better way.
4. The discount rate, k, applied for discounting the future cash flows is in fact, the minimum required rate of return which incorporates both the pure return as well as the premium required to set off the risk.
5. The NPV technique represents the net contribution of a proposal towards the wealth of the firm and is therefore, in full conformity with the objective of maximization of the wealth of the shareholders.

The above merits of the NPV technique make it a popular technique of evaluation of capital budgeting proposals. The very fact that this technique is capable of evaluating the proposals that are profit seeking and involve cash flows over a period of several years makes it a preferred technique of evaluation of capital budgeting proposals. But this does not mean that it is free from shortcomings. The NPV technique has the following shortcomings.

(*i*) It involves difficult calculations. Moreover, it may not be able to overcome the uncertainty involve with cash flows occurring after a sizeable time gap. It fails to answer questions such as : How to quantify the potential error inherent in the cash flow estimates, and how does the measure help making investment choices if such errors are significant ?

(*ii*) The NPV technique requires the predetermination of the required rate of return, k, which itself is a difficult job. If the value of the 'k' is not correctly taken, then the whole exercise of the NPV may give wrong results,

(*iii*) The NPV technique does not provide a measure of project's own rate of return, rather it evaluates a proposal against an external variable *i.e.* the minimum required rate of return,

(*iv*) The decision under the NPV technique is based on a value which is an absolute measure. It ignores the difference in initial outflows, size of different proposals etc. while evaluating mutually exclusive proposals.

There is a variant of the NPV technique, known as the Profitability Index discussed as follows :

Profitability Index (PI)

PI is defined as the benefits (in present value terms) per rupee invested in the proposal. This technique which is a variant of the NPV technique, is also known as Benefit-cost ratio, or Present Value index. The PI is based upon the basic concept of discounting the future cash flows and is ascertained by comparing the present value of the future cash inflows with the present value of the future cash outflows. The PI is calculated by dividing the former by the latter.

Calculation : The PI is calculated as follows :

$$PI = \frac{\text{Total Present Value of Cash Inflows}}{\text{Total Present Value of Cash Outflows}}$$

$$PI = \sum_{i=1}^{n} \frac{CF_i}{(1+k)^i} \div C_o$$

For example, a firm is evaluating a proposal which requires a cash outlay of ₹ 40,000 at present and of ₹ 20,000 and at the end of third from now. It is expected to generate cash inflows of ₹ 20,000, ₹ 40,000 and Rs, 20,000 at the end of 1st year 2nd year and 4th year respectively. Given the rate of discount of 10%, the calculation of PI has been presented in Table 4.3.

TABLE 4.3 : CALCULATION OF THE PROFITABILITY INDEX.

Year	Cash flows (₹)	PVF(10%n)	Present Values (₹)
0	–40,000	1.000	–40,000
1	20,000	.909	18,180
2	40,000	.826	33,040
3	–20,000	.751	–15,020
4	20,000	.683	13,660

Present value of cash outflows = ₹ 40,000+15,020 = 55,020.
Present value of cash inflows = ₹ 18,180+33,040+13,660
= ₹ 64,880.

$$PI = \frac{\text{Total Present Value of Cash Inflows}}{\text{Total Present Value of Cash Outflows}}$$

$$= \frac{₹\ 64,880}{₹\ 55,020} = 1.18$$

The PI of 1.18 can be interpreted as follows : In present value terms, for every ₹ 1 invested, the proposal is expected to give a return of ₹ 1.18. So, in case of PI, the question is simply : How much present value benefits are being created for each rupee of net investment.

Quite often one may be faced with a choice involving several alternative investment of different size. In such a case, he cannot be indifferent to the fact that even though the NPV of different alternatives may be close or even equal, these involve commitments of widely ranging amounts. In other words, it does make a difference whether an investment proposal promises a NPV of ₹ 1,000 for an outlay of ₹ 10,000; or whether an outlay of ₹ 25,000 is required to get the same NPV of ₹ 1,000, even if the lives of the projects are assumed to be same. In the first case, the NPV is much larger fraction (₹ 1,000/10,000) then what it is in the second case *i.e.*, (₹ 1,000/25,000), which makes the first proposal clearly more attractive. The PI technique is a formal way of expressing this cost/benefit relationship.

The Decision Rule : Under the PI technique, the decision rule is : *'Accept the project if its PI is more than 1 and reject the proposal if the PI is less than 1'*. However, if the PI is equal to 1, then the firm may be indifferent because the present value of inflows is expected to be just equal to the present value of the outflows. In case of ranking of mutually exclusive proposals, the proposal with the highest positive PI will be given top priority while the proposal with the lowest PI will be assigned lowest priority. The proposals having PI of less than 1 are likely to be outrightly rejected.

The Critical Evaluation : The PI technique, as already noted is an extension of the NPV technique. In the NPV technique, the difference between the present value of inflows and the present value of outflows was the yardstick. Therefore, the PI as a technique of evaluation of capital budgeting proposals has the same merits and shortcomings which the NPV has.

NPV *vs.* PI — A comparison : As far as, the accept-reject decision is concerned, both the NPV and the PI will give the same decision. The reasons for this are obvious. The PI will be greater than 1 only for that project which has a positive NPV, the project will be acceptable under both the techniques. On the other hand, if the PI is equal to 1 then the NPV would also be 0. Similarly, a proposal having PI of less than 1 will also have the negative NPV. However, a conflict between the NPV and the PI may arise in case of evaluation of mutually exclusive proposals.

For example, a firm is evaluating two proposals, A and B, having costs of ₹ 1,00,000 and ₹ 80,000 respectively. The present value of the inflows of these projects are ₹ 1,20,000 and ₹ 1,00,000. Consequently, both the proposals have NPV of ₹ 20,000 and therefore, are alike. In this case, the PI technique seems to give a better result. The PI of both the projects can be calculated as follows :

$$PI = \frac{\text{Total Present Value of Cash Inflows}}{\text{Total Present Value of Cash Outflows}}$$

$$PI(A) = \frac{₹\ 1,20,000}{₹\ 1,00,000} = 1.20$$

$$PI(B) = \frac{₹\ 1,00,000}{₹\ 80,000} = 1.25$$

Thus, in a terms of the NPV technique, both projects are alike, but in terms of the PI technique, the project B is better. The reason being that the project B entails lesser cash outflow of ₹ 80,000 only and still generating net benefits of ₹ 20,000 (*i.e.* ₹ 1,00,000-₹ 80,000), against the project A which is also gener-

ating net benefits of ₹ 20,000 but requires a larger outlay of ₹ 1,00,000.

The NPV and the PI may give contradictory decisions even if the net monetary benefits and the initial cost are different. For example, two projects, A and B having initial cash outflows of ₹ 1,50,000 and ₹ 1,10,000 are being evaluated. The present value of cash inflows of these projects are ₹ 2,10,000 and ₹ 1,65,000 respectively. In such a case, the NPV of the proposals are ₹ 60,000 and ₹ 55,000 respectively and therefore project A is to be preferred over project B. But the PI of these two projects are 1.4 and 1.5 respectively and therefore as per PI technique the project B is to be preferred. The question therefore is : Which project be accepted ? In such a situation, the NPV decision should be preferred unless there is a capital rationing. If the firm has funds of ₹ 1,50,000 to invest, then project A (as per the NPV technique) should be adopted. This will result in increase in shareholders wealth to the extent of ₹ 60,000 against project B which will increase the wealth only by ₹ 55,000. The better project, obviously, is one which adds more to the wealth of the shareholders.

Discounted Payback Period

This method is a combination of the original payback method and the discounted cash flow technique. In this method, the cash flows of the project are discounted to find their present values. The total present value of the cash inflows is then compared with the present value of the outflows, in order to identify the period taken to recover the initial cost or the present value of outflows. This method thus, takes care of the main drawback of the payback period method and allows the consideration of the time value of money of cash flows. However, it still does not take into account those cash inflows which occur subsequent to the payback period and sometimes these cash inflows may be substantial. Since, it is a variant of the original payback period method, the discounted payback period method is also calculated in the same way as the payback period, except that the future cash inflows are first discounted and then the payback is calculated. However, the discounted payback method is superior as, in addition to the recovery of original investment, the time value of money is also considered. In the discounted payback method, a project is acceptable if its discounted payback is less than target payback period.

Internal Rate of Return (IRR)

The other important discounted cash flow technique of evaluation of capital budgeting proposals is known as IRR technique. The IRR of a proposal is defined as the discount rate which produces a zero NPV *i.e.,* the IRR is the discount rate which will equate the present value of cash inflows with the present value of cash outflows. Like the NPV, the IRR is also based on the discounting technique. In the IRR technique, the time-schedule of occurrence of the future cash flows is known but the rate of discount is not. Rather this discount rate is ascertained by the trial and error procedure. This rate of discount so calculated, which equates the present value of future cash inflows with the present value of outflows, is known as the IRR.

Calculation : Symbolically, the IRR is equal to the value of 'r' in the Equation 4.3.

$$CO_0 = \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \cdots\cdots + \frac{CF_n}{(1+r)^n} + \frac{SV + WC}{(1+r)^n} \qquad (4.3)$$

where, CO_0 = Cash outflow at time 0,
CF_i = Cash inflow at different point of time,
n = Life of the project, and
r = Rate of discount (yet to be calculated)
SV & WC = Salvage value and Working capital at the end of the n years

The Equation 4.3 can also be written as :

$$CO_0 = \sum_{i=1}^{n} \frac{CF_i}{(1+r)^i} + \frac{SV+WC}{(1+r)^n}$$

$$\text{or, } 0 = \sum_{i=1}^{n} \frac{CF_i}{(1+r)^i} + \frac{SV+WC}{(1+r)^n} - CO_0$$

The Equation 4.3 is solved to ascertain the value of 'r'. The value of 'r' can only be ascertained by the trial and error procedure together with linear interpolation. Successive application of different discount rates to all cash flows must be made until a close approximation of a zero NPV is found. With some experience, an analyst will find that usually no more than two trials are necessary, because the first result will show the direction of any refinement needed. A positive NPV indicates the need for a higher discount rate, while a negative NPV calls for lowering the discount rate.

The specific procedure to find out the value of 'r' implies finding out the net present value of the proposal at two different assumed values of 'r' within which the IRR is expected to lie. Thereafter, the two rates are interpolated to make the net present value equal to zero. The detailed procedure for the calculation of IRR can be explained in two different situations *i.e.,* (*i*) when future cash flows are equal and take a form of annuity, and (*ii*) when future cash flows are unequal. Both the situations have been taken up as follows :

When future cash flows are equal: In case the proposal has only one cash outflow in the beginning and a stream of equal cash inflows in future, the calculation of IRR is rather simple. This can be explained with the help of an example.

A firm is evaluating a proposal costing ₹ 1,00,000 and having annual inflows of ₹ 25,000 occurring at the end of each of next six years. There is no salvage value. The IRR of the proposal may be calculated as follows :

Step 1 : Make an approximation of the IRR on the basis of cash flows data. A rough approximation may be made with reference to the payback period. The payback period in the given case is 4 years. Now, search for a value nearest to 4 in the 6th year row of the PVAF table. The closest figures are given in rate 12% (4.111) and the rate 13% (3.998). This means that the IRR of the proposal is expected to lie between 12% and 13%.

Step 2 : In order to make a precise estimate of the IRR, find out the NPV of the project for both these rates as follows :

At 12%, NPV = (₹ 25,000×$PVAF_{(12\%, 6y)}$)–₹ 1,00,000
= (₹ 25,000×4.111)–₹ 1,00,000
= ₹ 2,775.
At 13%, NPV. = (₹ 25,000×$PVAF_{(13\% 6y)}$)–₹ 1,00,000
= (₹ 25,000×3.998)–₹ 1,00,000
= ₹ –50.

Step 3 : Find out the exact IRR by interpolating between 12% and 13%. It may be noted that IRR is the rate of discount at which the NPV is zero. At 12%, the NPV is ₹ 2,775 and at 13% the NPV is ₹ –50. Therefore, the rate at which the NPV is zero will be higher than 12% but less than 13%. This rate, at which NPV is Zero, may be found with the help of interpolation technique. The formula using the interpolation method is as follows:

$$IRR = L + \frac{A}{(A - B)} (H–L)$$

where, L = Lower discount rate, at which NPV is positive
H = Higher discount rate, at which NPV is negative.
A = NPV at Lower discount rate, L.
B = NPV at Higher discount rate, H.

By interpolating difference of 1% *i.e.*, (13% – 12%), over NPV difference of ₹ 2,825 *i.e.*, [₹ 2,775 – (–50)],

$$IRR = L + \frac{A}{(A - B)} \times (H–L)$$

$$IRR = 12\% + \frac{2,775}{2,775 - (-50)} \times (13 - 12)$$

$$= 12.98\%$$

So, the IRR of the project is 12.98%.

It may be noted that interpolation method gives an approximation of the IRR. The greater the difference between two discount rates that have a positive and a negative NPV, the less accurate is the IRR. So, the interpolation should be made between the two closest possible discount rates, preferably two consecutive discount rates having a positive and a negative NPV.

When future cash flows are not equal : In case when the project is expected to generate an uneven stream of cash flows, the calculation of the IRR is complicated. In order to minimize the number of calculations, one can start by guessing the IRR in either of the two ways :

(*a*) If the cash inflows approximate, in a broader sense, an annuity, then the technique explained as above can be applied.

(*b*) If there is no apparent pattern of annuity in the cash inflows then the weighted average of cash inflows can be used as follows :

Suppose a firm is evaluating a proposal costing ₹ 1,60,000 and expected to generate cash inflows of ₹ 40,000, ₹ 60,000, ₹ 50,000, ₹ 50,000 and ₹ 40,000 at the end of each of next 5 years respectively. There is no salvage value thereafter. In this case, there is an uneven stream of cash inflows and the IRR can be approximated as follows :

Step 1 : Find out the weighted average of cash inflows :

Year	Cash inflow (₹) CF	Weight (W)	CF × W
1	40,000	5	2,00,000
2	60,000	4	2,40,000
3	50,000	3	1,50,000
4	50,000	2	1,00,000
5	40,000	1	40,000
	Total	15	7,30,000

Weighted average = 7,30,000/15 = ₹ 48,667.

Note that the weights used are stated in the reverse order in order to give maximum weight to the earliest cash inflow. It may be noted that simple (arithmetic) average can also be used in placed of weighted average. The purpose of using average cash inflow in to arrive at some approximate IRR.

Step 2 : Consider the weighted (or simple) average as the annuity of cash inflows and find out the payback period. For the above case, the payback period is ₹ 1,60,000/48,667 = 3.288.

Step 3 : Now, search for a value nearest to 3.288 in 5 years row of the PVAF table. The closest figures given in the table are at 15% (3.352) and at 16% (3.274). This means that the IRR of the proposal is expected to lie between 15% and 16%.

Step 4 : Find out the NPV of the proposal for both of these approximate rates as follows :

Year	Cash inflow	$PVF_{(16\%,5y)}$	$PVF_{(15\%,5y)}$	PV(16%)	PV(15%)
1	40,000	.862	.870	34,480	34,800
2	60,000	.743	.756	44,580	45,360
3	50,000	.641	.658	32,050	32,900
4	50,000	.552	.572	27,600	28,600
5	40,000	.476	.497	19,040	19,880
		Total		1,57,750	1,61,540

AT 16%, NPV = ₹ 1,57,750 – ₹ 1,60,000
= ₹ –2,250
At 15%, NPV = Rs, 1,61,540 – ₹ 1,60,000
= ₹ 1,540.

Step 5 : Find out the exact IRR by interpolating between 15% and 16%. At 15% the NPV is ₹ 1,540 and at 16% the NPV is ₹ –2,250. Therefore, the rate at which NPV is zero will be more than 15% but less than 16%. By interpolating the difference of 1% (*i.e.* 16% –15%) over the NPV difference of ₹ 3,790 [*i.e.* ₹ 2,250 – (– 1,540)],

$$IRR = 15\% + \frac{1,540}{1,540 - (-2,250)} \times (16 - 15)$$

$$= 15.40\%$$

So, the IRR of the project is 15.40%.

The Decision Rule : In order to make a decision on the basis of IRR technique, the firm has to determine, in the first

instance, its own required rate of return. This rate, k, is also known as the *cut-off rate or the hurdle rate*. A particular proposal may be accepted if its IRR, r, is more than the minimum rate *i.e.*, k, otherwise rejected. However, if the IRR is just equal to the minimum rate, k, then the firm may be indifferent. In case of ranking of mutually exclusive proposals, the proposal with the highest IRR is given the top priority while the project with the lowest IRR is given the lowest priority. Proposals whose IRR is less than the minimum required rate, k, may altogether be rejected.

This decision rule is based on the fact that the NPV of the project is zero if its cash flows are discounted at the minimum required rate *i.e.*, k. If the proposal can give a return higher than this minimum required rate, then it is expected to contribute to the wealth of the shareholders. It may be noted however, that the IRR, r, of the proposal is internal to the project while the minimum required rate, k, is external to the project.

The Critical Evaluation : Besides the NPV technique, the IRR technique is the other important discounted cash flow technique of evaluation of capital budgeting proposals. The IRR technique has been compared with the NPV technique at a later stage. However, the merits of the IRR technique can be summarized as follows :

(*i*) The IRR technique takes into account the time value of money and the cash flows occurring at different point of time are adjusted for time value of money to make them comparable,

(*ii*) It is a profit oriented concept and helps selecting those proposals which are expected to earn more than the minimum required rate of return. As discussed in Chapter 10, this minimum required rate of return is the cost of capital of the firm. So, the IRR technique helps achieving the objective of maximization of shareholders wealth.

(*iii*) The IRR of a proposal is expressed as a percentage and is compared with the cut-off rate which is also expressed as a percentage. Thus, the IRR has an appeal for those who want to analyze a proposal in terms of its percentage return,

(*iv*) Like NPV technique, the IRR technique is also based on the consideration of all the cash flows occurring at any time. The salvage value, the working capital used and released etc. are also considered,

(*v*) The IRR technique is based on the cash flows rather than the accounting profit.

Thus the IRR technique possesses all the ingredients of a sound evaluation technique. Still it has, on the other hand, some drawbacks as follows :

(*a*) As far as the calculation of IRR is concerned, it involves a tedious and complicated trial and error procedure.

(*b*) IRR technique makes an implied assumption that the future cash inflows of a proposal are reinvested at a rate equal to the IRR. Say, in case of mutually exclusive proposals, say A and B, having IRR of 18% and 16%, the IRR technique makes an implied assumption that the future cash inflows of project A will be reinvested at 18%, while the cash inflows of project B will be reinvested at 16%. It is imaginary to think that the same firm will have different reinvestment opportunities depending upon the proposal accepted.

(*c*) Since, the IRR is a scaled measure, it tends to be biased towards the smaller projects which are much more likely to yield high percentage returns over the larger projects.

(*d*) There are a number of scenarios when, the IRR technique may give dubious results. The first occurs when there is more than one IRR for a project and it is not clear which one the decision maker should use and second, occurs when IRR cannot be computed or if computed, is likely to be meaningless. This may be explained as follows :

(*i*) There is a mathematical possibility that a complex proposal with varied cash inflows and outflows may result in two different IRR because of the pattern and timing of the inflows and outflows. The value of 'r' calculated as per the procedure given above may be multiple values. For example, a firm is evaluating a project requiring a cash outlay of ₹ 800 in the beginning and ₹ 1,300 at the end of the 2nd year. The project is expected to generate only 1 cash inflow of ₹ 2,100 at the end of 1st year. The IRR of the proposal can be calculated as follows :

$$₹\ 800 = \frac{₹\ 2{,}100}{(1+r)^1} - \frac{₹\ 1{,}300}{(1+r)^2}$$

Taking $(1 + r)$ equal to x and dividing both the sides of the above equation by 100,

$$8 = \frac{21}{x} - \frac{13}{x^2}$$

$$8x^2 = 21x - 13$$

$$0 = 8x^2 - 21x + 13$$

In this quadratic equation, the value of x can be calculated with the help of the formula :

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

By applying the values of a, b, c as equal to 8, –21 and 13, the value of x can be identified as 1 and 1.62. Since, $x = (1 + r)$, therefore, the value of r comes to zero and 62%. Thus, the above proposal has two IRRs *i.e.* 0% and 62%. The question is therefore, which IRR (0% or 62%) is relevant for decision making? Multiple IRR will arise whenever cash flows display a multiple occurrences of cash inflows and outflows. If an outflow is designated as '-' (*i.e.*, is minus) sign and inflow is designated as '+' (*i.e.*, plus) sign, then there may be as many IRRs as there are changes in signs of cash flows.

(*ii*) In certain cases, the IRR technique may give some indeterminate results also. Consider a proposal with annual cash flows of ₹ –1,000, + 1,500 and –1,000. The IRR calculation of this series of cash flows involves calculation of the value of $\sqrt{1}$ which is indeterminate. In such a case, the value of IRR is also indeterminable or in other words, there is no real IRR.

NPV versus IRR: The IRR approach solves for a rate unique to each project, while the NPV approach solves for the trade-off cash inflows and outflows using a general required rate of return. On the basis of the above discussion of NPV and IRR, a comparison between the two may be attempted as follows:

(*a*) *Superiority of IRR over NPV :* IRR may be considered superior to the NPV for the following reasons :

(*i*) IRR gives percentage return while the NPV gives absolute return.

(*ii*) For IRR, the availability of required rate of return is not a pre-requisite while for NPV it is must.

(*b*) *Superiority of NPV over IRR :* The NPV is said to have superiority over IRR for

(*i*) NPV shows expected increase in the wealth of the shareholders.

(*ii*) NPV gives clear cut accept-reject decision rule, while the IRR may give multiple results also.

(*iii*) The NPV of different projects are additive while the IRRs cannot be added.

(*iv*) NPV gives better ranking as compared to the IRR (this has been discussed later in details).

Modified Internal Rate of Return

The basic shortcoming of the IRR technique is the implied reinvestment rate assumption (discussed later). This problem can be overcome by modifying the IRR procedure a bit. This procedure is called Modified Internal Rate of Return (MIRR). In case of MIRR, the assumption is that all intervening cash inflows over the life of the project are reinvested at a rate equal to the reinvestment rate for the remaining life of the project. This total cumulative value of all cash inflows is then discounted back to be equal to the present value of all cash outflows. The rate of discount at which the P.V. of Cumulative Terminal Inflows is equal to the P.V. of cash outflows, is known as MIRR. Symbolically, MIRR can be defined as follows :

$$\text{P.V. of Outflows} = \text{C.T.V.} \div (1+\text{MIRR})^n$$

$$\text{or, } = \left[\sum_{i=0}^{n} \frac{\text{COF}_i}{(1+k)^i} = \frac{\sum_{i=1}^{n} \text{CIF}_i (1+r)^{n-i}}{(1+\text{MIRR})^n} \right]$$

where, COF = Cash Outflows in i^{th} year,
CIF = Cash Inflows in i^{th} year,
C.T.V. = Cumulative Terminal Value of all Inflows,
k = Required Rate of Return,
r = Reinvestment Rate,
n = Life of the Project,
MIRR = Modified Internal Rate of Return (yet to be calculated).

For example, a project has an initial outflow of ₹ 20,000 and the expected cash inflows over next 3 years are ₹ 7,000, ₹ 10,000 and ₹ 8,000. The required rate of return, k (which can also be taken up as the reinvestment rate) is 10%. The MIRR calculation is presented in figure 4.3.

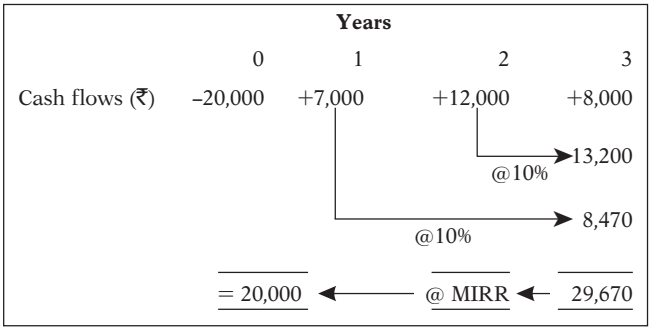

FIGURE 4.3: CALCULATION OF MODIFIED INTERNAL RATE OF RETURN (MIRR)

In figure 4.3, cash inflows for year 1 and 2 have been cumulated for two and one year respectively @ 10%. The total cumulative value of all cash inflows is ₹ 29,670. Now, this value is discounted to be equal to ₹ 20,000. The implied rate of discount in this process would be called the MIRR. It can be calculated as follows:

₹ 20,000 = ₹ 29,670 ÷ $(1 + \text{MIRR})^3$

MIRR = .1405 or 14.05%.

So, the MIRR for the project is 14.05%. The IRR for the project is 16%. So, the IRR is more than MIRR. However, this is not so always. If in the same case, the cost of the project is ₹ 25,000 (instead of ₹ 20,000) then MIRR and IRR of the project would be 5.76% and 4.54%. The reason is obvious. When the IRR of the project is more than the reinvestment rate, then by implication, cash inflows are invested at IRR, thus making IRR more than MIRR. However, when IRR is less than reinvestment rate, the cash inflows are reinvested at a rate lesser than required rate and thus making MIRR to be more than IRR.

The above example suggests the following steps in the calculation of MIRR:

(*i*) Find out the cash outflows at time zero. This is P.V. of outflows.

(*ii*) Find out the cumulative value of all intervening cash inflows at a rate equal to the reinvestment rate of the firm.

(*iii*) Add up all these cumulative values.

(*iv*) Discount this total cumulative value to be equal to the P.V. of cash outflows. The rate of discount implied is the MIRR.

Decision Rule for MIRR: MIRR is compared with the required rate of return of the project. A project may be accepted or rejected applying the following criterion:

If MIRR ≥ Required Rate of Return: Accept the proposal, and

If MIRR < Required Rate of Return : Reject the proposal.

MIRR technique seems to have an edge over IRR technique as the former directly specify the reinvestment rate whereas in the latter, the reinvestment rate is equal to the IRR itself. In fact, MIRR has the intuitive appeal of IRR together with realistic reinvestment rate assumption.

Conclusion on the Discounted Cashflow Techniques: On the basis of the above discussion it can be stated that the

Discounted Cash Flow techniques (DCF) have considerable advantage over the other techniques *i.e.*, the payback period and the accounting rate of return. The superiority of the discounted cash flow techniques over the traditional technique can be summarized as follows :

(*a*) The DCF techniques allows for the time value of money and are based on all the cash flows of the proposal.

(*b*) The DCF techniques are based on cash flows which are not affected by the discretionary accounting policies of the firm.

(*c*) The DCF techniques provide a clear cut decision rule, and

(*d*) The risk associated with future uncertainties can be easily incorporated in the DCF techniques by adjusting the required rate of return or the cut-off rate. This has been explained later.

CAPITAL BUDGETING DECISIONS : SOME CASES

THE ACCEPT-REJECT DECISIONS : The Accept-Reject Decision is the simplest of all the capital budgeting decisions. Such a decision occurs when :

(*a*) Different projects are economically independent *i.e.*, the cash inflows and outflows of one proposal do not affect and are not affected by the cash flows of other proposals.

(*b*) An individual proposal is accepted or rejected without regard to any other proposal.

(*c*) Accepting or rejecting a proposal has no impact on the desirability of other proposals, and

(*d*) There are no two proposals, at the same time, which are competing with each other.

Decision Rule : "Accept all the Good Ones".

The NPV technique : *Accept the proposal if the NPV is greater than or equal to zero and reject the proposal if the NPV is negative.*

The IRR technique : *Accept the proposal if the IRR is greater than or equal to a pre-determined cut-off rate (which in fact is the firm's minimum required rate of return), and reject the proposal if the IRR is less than the cut-off rate.*

Example 4.1

ABC Ltd. is considering an expansion of the installed capacity of one of its plant at a cost of ₹ 35,00,000. The firm has a minimum required rate of return of 12%. The following are the expected cash inflows over next 6 years after which the plant will be scrapped away for nil value.

Year	Cash Inflows
1	₹ 10,00,000
2	10,00,000
3	10,00,000
4	10,00,000
5	5,00,000
6	5,00,000

Consider the proposal on the basis of the NPV and IRR techniques.

Solution :

In order to find out the IRR of the proposal, the approximate IRR should be ascertained in the first instance.

Approximate IRR : Since the stream of cash inflows is more or less an annuity of ₹ 10,00,000, the payback period can be taken at 4 years. Now, search for figures nearest to 4 in the 6 year row of the PVAF table. The respective figures are 4.111 (12%) and 3.998 (13%). Thus, the IRR is expected to lie between 12% and 13%. Now the calculation of NPV (at 12%) and the IRR of the project can be taken up as follows :

Year	Cash inflows	$PVF_{(12\%,6y)}$	$PVF_{(13\%,6y)}$	PV(12%)	(PV(13%)
1	₹10,00,000	.893	.885	₹8,93,000	₹8,85,000
2	10,00,000	.797	.783	7,97,000	7,83,000
3	10,00,000	.712	.693	7,12,000	6,93,000
4	10,00,000	.636	.613	6,36,000	6,13,000
5	5,00,000	.567	.543	2,83,500	2,71,500
6	5,00,000	.507	.480	2,53,500	2,40,000
		Total		35,75,000	34,85,500

IRR of the proposal:

NPV at 12% = ₹ 75,000

NPV at 13% = ₹ 34,85,500 – ₹ 35,00,000

= ₹ –14,500

Interpolating between 12% and 13%,

$$\text{IRR} = 12\% + \frac{75{,}000}{75{,}000 - (-14{,}500)} \times (13 - 12)$$

$$= 12.84\%$$

NPV of the proposal (Required Rate of Return 12%) :

NPV = ₹ 35,75,000 – ₹ 35,00,000

= ₹ 75,000.

So, the IRR of the project is 12.84% and the NPV of the project is ₹ 75,000. Therefore, the proposal is acceptable on the basis of both the NPV and the IRR techniques.

THE REPLACEMENT DECISIONS : A replacement decision occurs when one asset is proposed to be replaced with another. For example, an existing machine is proposed to be replaced in order to enhance the production. In order to discuss the replacement decision, an important assumption is that the economic life of the new asset is equal to the remaining economic life of the existing asset being replaced. For example, an asset which can still be used in normal way for a period of 6 years is to be replaced, then the assumption is that the new asset is also having the economic life of 6 years only.

The replacement decisions are not very different from other capital budgeting decisions. However, since a replacement decision involves disposal of some existing asset currently owned by the firm, **it involves measurement of incremental costs and benefits.**

In order to evaluate a replacement decision, the incremental net investment (cash outflows) and the incremental cash inflows, that result from the replacement action, are to be ascertained. For this purpose, incremental cash inflows may be defined as the cash inflows of the new asset less the cash

inflows of the existing asset. Different types of cash flows for a replacement decisions are as follows :

Initial Outflow	Cost of New Project + Additional Working Capital – Salvage Value (after tax) of Old (if any).
Subsequent Annual Inflows	Operating cash flows from the New project – Operating cash flows from the Old (if it was continuing).
Terminal Inflows	Salvage Value of new (Net of tax) + Release of Working Capital – Salvage Value of Old (Net of tax) (had it not been replaced).

Decision Rule :

The NPV technique : *Using the required rate of return as the discount rate, calculate the NPV of the incremental net investment and incremental cash inflows. Accept the proposal if the NPV is positive. However, if the NPV is negative, the firm may continue with the existing asset only.*

The IRR technique : *Compute the IRR of the incremental cash flows. Accept the proposal if the IRR is greater than the cut-off rate and get the replacement. However, the IRR is less than the cut-off rate, the firm may continue with the existing asset.*

Example 4.2

XYZ Ltd. is considering to replace one of its existing machines at a cost of ₹ 4,00,000. The existing machine can be sold at its book value, *i.e.*, ₹ 90,000. However, it has a remaining useful life of 5 years with salvage value zero. It is being depreciated at the rate of 20 per cent under written down value method.

The new machine can be sold for ₹ 2,50,000 after 5 years when it will be no longer required. It will be depreciated annually at the rate of 30 per cent under written down value method. The new machine is expected to bring savings of ₹ 1,00,000 in manufacturing cost per annum. Should the machine be replaced if the comapny is in 30 per cent tax bracket and the required rate return is 10 per cent. Ignore tax on gain or loss on sale of asset.

Solution :

In order to calculate the NPV of the replacement proposal, first of all the incremental depreciation be calculated as follows :

Year	Dep. on Existing	Dep. on New	Increase in Dep.
1	₹ 18,000	₹ 1,20,000	1,02,000
2	14,400	84,000	69,600
3	11,520	58,800	47,280
4	9,216	41,160	31,944
5	7,373	28,812	21,439

Calculation of NPV:

Year	Savings	Increase in Depreciation	Net Saving	Tax Liability @ 30%	Net Cash Flow	$PVF_{(10,n)}$	PV
1	₹ 1,00,000	₹ 1,02,000	₹ –2,000	₹ –600	₹ 1,00,600	.909	₹ 91,445
2	1,00,000	69,600	30,400	9,120	90,880	.826	75,067
3	1,00,000	47,680	52,720	15,816	84,184	.751	63,222
4	1,00,000	31,944	68,056	20,417	79,583	.683	54,355
5	1,00,000	21,439	78,561	23,568	76,432	.621	47,464
5	Salvage Value	—	—	—	2,50,000	.621	1,55,250
					Present Value of Inflows		4,86,803
					Less : Initial Outflow (₹ 4,00,000 – ₹ 90,000)		3,10,000
					Net Present Value		1,76,803

As the NPV of the replacement proposal is positive, the machine may be replaced.

Example 4.3

ABC Ltd. whose required rate of return is 10% is considering to replace one of its plants by a new plant. The relevant data for the existing plant as well as the proposed plant are as follows :

	Existing Plant	Proposed Plant
Present book value/cost	₹ 24,000	₹ 54,000
Remaining life	6 years	6 years
Depreciation (per annum)	₹ 4,000	₹ 9,000
Salvage value (current)	₹ 20,000	—
Profit before depreciation and tax (annual)	₹ 8,000	₹ 15,000

Evaluate the proposal/on incremental cash flows basis as per both the NPV and the IRR techniques given that (*i*) the tax rate applicable to the firm is 40%, and (*ii*) that the loss on disposal of an asset is not tax deductible.

Solution :

Incremental Net Investment or Net Initial Outflow:

Cost of the proposed plant	₹ 54,000
– Current scrap value of existing plant	₹ 20,000
Net cash outflow	₹ 34,000

Incremental annual cash inflows :

	Existing Plant	Proposed Plant	Incremental
Profit before depreciation	₹ 8,000	₹ 15,000	₹ 7,000
– Depreciation	₹ 4,000	₹ 9,000	5,000
Profit before tax	₹ 4,000	₹ 6,000	2,000
– Tax @ 40%	₹ 1,600	₹ 2,400	800
Profit after Tax	₹ 2,400	₹ 3,600	1,200
+ Depreciation (added back)	₹ 4,000	₹ 9,000	5,000
Cash inflow	₹ 6.400	₹ 12,600	6,200
Therefore, incremental annual cash inflow			₹ 6,200

NPV of the Proposal (Required Rate of Return 10%) :

$$\text{NPV} = (₹\,6{,}200 \times \text{PVAF}_{(10\%6y)}) - ₹\,34{,}000$$
$$= (₹\,6{,}200 \times 4.355) - ₹\,34{,}000$$
$$= ₹\,-6{,}999.$$

IRR of the proposal:

Since, the incremental cash inflows is an annuity of ₹ 6,200, the IRR may be approximated on the basis of the payback period which is 5.5 years. Now, on the basis of PVAF table, the values nearest to 5.5 in 6 years row are 5.601 (2%) and 5.242 (3%). Thus, the IRR of the proposal will lie between 2% and 3%. Since the cut-off rate is 10% which is much above than 3%, there is no purpose of calculation of the exact IRR.

The Decision : The proposal for replacing the old plant by a new one should be rejected. Both the NPV (*i.e.*, ₹ – 6,999) and the IRR (*i.e.*, between 2% and 3%) reject the proposal. Thus, the firm may continue with the existing plant only.

Remark : In case of replacement decision, both the NPV and the IRR techniques produce identical decisions. In such a case, either (*i*) the NPV will be positive and the IRR will be more than the cut-off rate, or (*ii*) NPV will be negative and the IRR will be less than the cut-off rate.

MUTUALLY EXCLUSIVE DECISIONS : Two or more capital budgeting proposals are said to be mutually exclusive when the acceptance of one of them results in implied and automatic rejection of all others. For example, a firm is considering a proposal to construct an office building for which several bids have been received. Now the selection of one contractor will impliedly reject all others. In applying the capital budgeting techniques to evaluate the mutually exclusive proposals, a specific assumption is required to be made *i.e.*, that all the alternative proposals have same economic life. (However, this assumption is relaxed later).

Decision Rule : "Accept only the Best One"

NPV technique : *The different alternative proposals are to be first ranked in order of their NPVs. The proposal with the highest positive NPV is placed on the top followed by others. The proposals with the highest positive NPV (which is assigned the top priority) is selected.*

IRR technique : The IRR of all the alternatives are calculated. The proposals are then ranked on the basis of their IRR. The proposal with the highest IRR is placed on the top followed by other proposals. The proposal whose IRR is more than the cut-off rate is considered to be acceptable. The proposal with the highest IRR (provided it is more than the cut-off rate) is selected.

It may be noted at this stage that the ranking of mutually exclusive proposals, as given by the NPV and the IRR, may either be identical or different. Both these situations have been discussed as follows :

(*a*) ***Identical NPV and IRR ranking*** : In most of the cases, the mutually exclusive proposals are ranked in the same order by both the NPV and the IRR techniques. For example, two mutually exclusive investment proposals, A and B, having 5 years economic life are being considered. Proposal A requires a net investment of ₹ 30,000 and produces a cash inflow of ₹ 10,000 p.a. Proposal B requires a net investment of ₹ 20,000 and produces a cash inflow of ₹ 6,000 p.a. Which proposal is preferable given that the minimum required rate of the firm is 10% ? In this case, the NPV and the IRR techniques produce the following results :

Proposal	NPV at 10%	IRR
A	₹ 7,910	19.87%
B	₹ 2,746	15.24%

Thus, both the NPV and the IRR prefer the proposal A because its NPV is positive and more than that of B; and the IRR is greater than the cut-off rate and is also more than the IRR of proposal B.

(*b*) ***Conflicting NPV and IRR ranking :*** The ranking of mutually exclusive proposals and the decision regarding selection of a proposal on the basis of NPV and IRR may not always be same. As long as the appropriate discount rate is used, the NPV technique will always provide the correct ranking, however, it is the IRR technique which may produce incorrect ranking while evaluating mutually exclusive proposals. In the following discussion, some observation have been made as to why the NPV and the IRR techniques may produce conflicting ranking. Why one proposals is found acceptable as per the NPV technique and some other proposal is found acceptable as per the IRR technique ? The reasons and conditions under which different rankings may occur, can be summarized as follows :

(*i*) ***Scale or Size disparity among different alternative proposals :*** The cost or scale of one proposal may be different from that of others. A conflict in ranking can arise because of the size difference of different proposals. The ranking of NPV technique, which deals with absolute net benefits, will be affected by the size of the proposals. Higher the cash outflow larger would be the expected returns in absolute terms and hence higher ranking would be. On the other hand, the IRR deals with relative returns (*i.e.*, in percentage form) and hence ignores the size of the proposal. For instance, if all the cash flows of a proposals are doubled, then the NPV will also double but its IRR would remain unchanged. The effect of the size of the proposal on the ranking as per NPV and IRR techniques can be explained with the help of Example 4.4.

Example 4.4

The following is the relevant information for two mutually exclusive proposals, X and Y, being evaluated by a firm.

Year	Cash flows (X)	Cash flow(Y)
0	–10,000	–30,000
1	5,000	14,000
2	6,000	19,000
3	4,000	10,000

Evaluate and rank these proposals as per the NPV and the IRR techniques given that the minimum required rate of return is 10%.

Solution :

The NPV and the IRR of both the proposals have been calculated and presented in the following table.

	Proposal X	Proposal Y
NPV at 10%	₹ 2,509	₹ 5,942
IRR	24.3%	21.5%

Thus, the NPV and IRR techniques are giving contradictory ranking. Proposal X should be selected as per IRR technique whereas proposal Y is better as per the NPV technique. The conflict between the two is arising because proposal Y is three times the size of proposal X. This gives higher net absolute benefits from proposal Y *i.e.*, the NPV of proposal Y is higher than that of proposal X. But in relative terms the proposal Y is less profitable with a lower percentage return of 21.5%. In view of the objective of maximization of shareholders wealth, the proposal Y is definitely preferable and should be selected. However, it may be noted that the above decisions is based on the implied assumption that the firm has adequate funds of ₹ 30,000 to take up the proposal Y. Otherwise, the decision may be reversed. If the firm is not having sufficient funds, then the situation is known as capital rationing.

(*ii*) ***Different timing or Time Disparity among alternative proposals:*** The ranking of mutually exclusive proposals as per NPV and the IRR technique may be different even when they involve the same or almost the same outlay. The different ranking may then occur as a result of different timing of the cash inflows of different proposals. The situation may arise when larger cash inflows from one proposal may occur during early period of its life time while larger cash inflows from some other competitive proposal may occur towards the end of economic life. For example, the cash inflows from one proposal may increase over time, while those of others may decrease or remains constant over time. The effect of time disparity on the difference in ranking of mutually exclusive proposals has been explained in Example 4.5.

Example 4.5

PQR Ltd., having required rate of return of 8%, is evaluating two mutually exclusive proposals A and B for which the relevant data is as follows :

Year	Cash flows (A) (₹)	Cash flows (B) (₹)
0	–2,500	–3,000
1	2,000	500
2	1,000	1,000
3	500	3,000

Evaluate and rank these proposals.

Solution :

The NPV and the IRR of both the proposals have been calculated and presented in the following table:

	NPV at 8%	IRR
Proposal A	₹ 606	24.8%
Proposal B	₹ 702	17.5%

In this case, the NPV and IRR techniques are giving contradictory results. As per the NPV techniques, the proposal B is better while as per the IRR technique, the proposal A is preferable. The difference in ranking is due to the fact that the timing of cash inflows of the two proposals is different. Proposal A is producing higher inflows in early years while proposals B is producing higher cash inflows in later years. But why then the different rankings ? The answer to this question is found in the implied assumption of the NPV and the IRR techniques, known as the **Reinvestment Rate Assumption.** This has been explained as follows :

Reinvestment Rate Assumption : The reinvestment rate assumption is the assumption regarding the rate of compounding and discounting the intermediate cash flows. This reinvestment rate is built into the present value factors (PVF and PVAF) which are used to find out the NPV and the IRR by adjusting the future cash inflows for time value of money. In any technique of evaluation of capital budgeting proposals, which discount the future cash inflows to find out their present values, there is an implied reinvestment rate assumption. It is assumed that when the cash inflows are received, they are immediately reinvested in another project or asset. This implied reinvestment rate assumption allows us to consider any proposal independently of (*i*) Where the cash inflows are going after they are received ? (*ii*) How they are being used ? and (*iii*) At what rate they are being reinvested by the firm.

The NPV technique assumes that all the intermediate cash inflows are reinvested at a rate equal to the discount rate. So, in case of mutually exclusive proposals, all the intermediate cash inflows are assumed to be reinvested at the same rate *i.e.* the discount rate regardless of which proposal is accepted. The IRR technique on the other hand, assumes that the intermediate cash inflows are reinvested at a rate equal to the proposal's IRR itself thus, different alternative proposals will have different reinvestment rates.

The conflict in the ranking of mutually exclusive proposals as per the NPV and the IRR techniques arises as a result of different reinvestment rate assumptions of the two techniques acting in different ways on the proposals having time disparity of cash inflows.

To continue with the Example 4.4, the NPV technique assumes that the cash inflows of both the proposals, A and B are being reinvested at 8% for the rest of the economic life of the proposal. On the other hand, the IRR technique assumes that the cash inflows of proposal A will be reinvested at 24.8% while the cash inflows of proposals B will be reinvested at 17.5%.

Thus, the NPV assumes that the future cash inflows will be reinvested only at the required rate of return while the IRR assumes that the firm will be able to reinvest the future cash inflows at IRR which may be higher or lower than the required rate of return. In practice, however, it may not be realistic to assume that the reinvestment rate of the firm will depend upon the proposal being accepted. The reinvestment rate is fixed and being an external variable it has nothing to do with the proposal being accepted or rejected.

(*iii*) ***Life disparity or proposals with Unequal lives :*** At the time of initiation of discussion on the mutually exclusive proposals, a specific assumption was made *i.e.,* that all the alternative proposals have equal lives. Even in case of discussion on the replacement decisions, the assumption was that the proposed asset has an economic life equal to the remaining life of the outgoing asset. Now, it is the time to relax this assumption. The mutually exclusive proposals may have different economic lives and this very fact should not affect the choice between them, even if the ranking as per the NPV and the IRR may be different. Example 4.6 illustrates this point.

Example 4.6

RST Ltd. having the minimum required rate of return of 12% is considering two mutually exclusive proposals, X and Y. The relevant data for the proposals are given below :

Year	Cash flows (X) (₹)	Cash flows (Y) (₹)
0	–50,000	–50,000
1	75,000	20,000
2	—	20,000
3	—	70,000

Evaluate the proposal on the basis of the NPV and the IRR techniques.

Solution :

The NPV and the IRR of the two proposals have been calculated and placed in the following table :

	NPV at 12%	IRR
Proposal X	₹ 16,975	50.00%
Proposal Y	₹ 33,640	36.45%

Thus, the two techniques are suggesting for contradictory decisions. The NPV technique is proposing that the project Y is preferable and should be selected, while the IRR technique is suggesting that project X is having higher IRR and should be selected. This contradiction in ranking is appearing inspite of the fact that both the proposal have same size (*i.e.* initial outlay of ₹ 50,000). The reason for difference in ranking is the difference in economic lives of the proposals. The proposal X is having an economic life of only one year while the proposal Y has economic life of three years. Still the proposal with the higher NPV should be selected as it will result in the higher increase in the wealth of the shareholders.

CAPITAL BUDGETING WITH UNEQUAL LIVES OF PROPOSALS

Quite often, a person may be required to select one alternative out of many options which are similar in all respect except that the lives of the proposals are different. For example, a choice is to be made between an expensive and latest technology washing machine having longer life, and a cheaper economy model that lasts fewer years. Similar may be the case, when a firm is confronted with a capital budgeting situation to select one out of, say, the following proposals: (*i*) One costing more with lower maintenance cost and lasting longer, and (*ii*) The other costing less, higher maintenance costs and dying out earlier.

Difference in economic lives may give rise to the following considerations.

1. The earlier receipts of cash inflow from a shorter project may be advantageous.
2. If the project can be repeated, then the length of the project will be an important factor since the NPV of a shorter period project is recovered more frequently than the NPV of a longer period project.

For example, a firm is evaluating the following two proposals @ 15% discount rate:

Year	Project X (₹)	Project Y (₹)
0	–24,000	–44,000
1	14,000	16,000
2	14,000	16,000
3	14,000	16,000
4	—	16,000
5	—	16,000

In this case, the NPVs of the proposals are ₹ 7,962 (project X) and ₹ 9,632 (project Y). Hence, if these are one off investment, the firm should select the proposal Y as it is having higher NPV. However, in making this decision on the basis of the NPV of two proposals, an important consideration has been overlooked *i.e.,* the NPV of the project X is realized within three years while the NPV of project Y is realized in five years. The early recovery of NPV from project X can possibly be reinvested elsewhere to get some return. But this aspect has not been considered in the above analysis. Thus, the above procedure is not correct because it introduces, impliedly, a bias in favour of the proposal with a longer life.

Therefore, the calculation of NPV should not be done as above, in case the proposals are differing in respect of their economic lives. Comparing the NPVs of two proposals, X and Y, is meaningless because outcomes of year 4 and year 5 for project X are not known. Now say, the Project X and Y can be repeated and the firm replaces the project X at the end of year 3 by the same project. By comparing project X and project Y, it is found that the project Y would have the cash inflows only up to year 5, whereas the inflows from project X (after

replacement) would be available up to year 6. This will continue until a spectrum of 15 years is taken over which 5-project X and 3-project Y would have been installed and both would require the next replacement at the same time. But this is unnecessarily complicating the whole exercise. What is in fact, needed is a modification to convert the NPVs of projects X and Y into some sort of comparable figures. One such modification technique is known as **Equivalent Annuity Method (EAM).**

Equivalent Annuity Method (EAM) : Uneven lives of capital proposals pose complications that are handled by adjusting the analysis to equalize the time spans. This can be achieved by truncating the life of a proposal with an assumed recovery of capital from disposal at an earlier point, or extending the shorter alternative assuming repeated investment. Alternatively, mutually exclusive proposals with different lives can be compared by annualizing their NPVs over their respective lives to arrive at an annual equivalent benefit or cost.

The EAM involves the concept which is reverse of the concept of present value of an annuity. The equivalent annuity is defined as the amount of annuity for 'n' years, which has a present values discounted at 'r' percent per annum equivalent to the given amount. In order to understand the concept of EAM, the above situation can be explained in a different way. The NPV of a proposal is the net benefit expected from that proposal. So, the NPV of the project X is the benefit, the firm can obtain every three years; and the NPV of the project Y is the benefit, the firm can obtain every five years. Therefore, the question is : Should the firm prefer NPV of ₹ 7,962 every three years or NPV of ₹ 9,632 every five years. In order to make a choice between these two situations, the concept of EAM may be used.

The present value of an annuity for 'n' years at 'r' percent rate may be defined as

PV of annuity = Annuity Amount x $PVAF_{(r,n)}$

Or, Annuity Amount = PV of annuity/$PVAF_{(r.n)}$

In the above case, the project X has the NPV of ₹ 7,962. Considering this to be the present value of annuity of three years at discount rate of 15%, the annuity amount can be calculated as :

Annuity Amount (X) = ₹ 7,962/2.283
= ₹ 3,488.

Similarly, for project Y,

Annuity Amount (Y) = ₹ 9,632/3.352
= ₹ 2,873.

The Equivalent Annuity of ₹ 3,488 and ₹ 2,873 can be interpreted as follows:

Project X : Project X is giving NPV of ₹ 7,962 after a period of every three years. This can also be considered as an annuity of ₹ 3,488 for three years; and with replacement every three years, this can be considered as a perpetuity of ₹ 3,488 forever.

Project Y : Project Y is giving NPV of ₹ 9,632 after a period of every five years. This can also be considered as an annuity of ₹ 2,873 for five years; and with replacement every five years, this can be considered as a perpetuity of ₹ 2,873 forever.

Thus, an EA amount is an annual cash inflow arising perpetually at the end of each year in future. The question before the firm was to select between the NPV of ₹ 7,962 (Project X) every three years or the NPV of ₹ 9,632 (Project Y) every five years. Now, in the light of the above, the same can be expressed as a choice between a perpetuity of ₹ 3,488 (Project X) and ₹ 2,873 (Project Y). The choice now, is obvious and the firm will like to select project X only.

Present Value of Perpetuity of EA : Since, the EA is defined as the perpetuity also, the present value of this perpetuity can be ascertained as follows:

PV of perpetuity = Annuity Amount/Rate of Discount.

Therefore, for project X,

PV of perpetuity = Annuity Amount/Rate of Discount
= ₹ 3,488/.15 = ₹ 23,253.

and, for project Y, = Annuity Amount/Rate of Discount

PV of perpetuity = ₹ 2,873/.15 = ₹ 19,153.

For project X the present value of the perpetuity is ₹ 23,253 and for project Y the present value of the perpetuity is ₹ 19,153. So, again the project X having higher present value of the perpetuity should be selected.

RISK ANALYSIS IN CAPITAL BUDGETING

The cash flows from an investment are estimated when the proposal is evaluated, however, the returns are not known until the cash flows actually occur. The uncertainty of returns from the moment, the funds are invested until management and investor know how much the projects has earned, is a primary determinant of a proposal's risk.

In case, the cash flows associated with a proposal are known with certainty then the techniques such as NPV, IRR or any other may be used to evaluate the desirability of the proposal. However, when the cash flows are not known with certainty, a measure of risk of the proposal should also be brought into the evaluation system. Such resultant capital budgeting decision criterion will then evaluate the proposals by considering both the rusk and return associated with the proposal. As already discussed above, a proposal is said to contain risk when the set of possible cash flows is known but it is not possible at time 0 (when the decision is being is taken) to predict the specific cash flows that will actually occur in future.

For example, an investment requiring an initial outlay of ₹ 50,000 is expected to result in cash inflow of ₹ 70,000 at the end of 1 year. In this case, there is no risk involved as both the inflows and outflows are known with certainty. However, if the inflow at the end of one year may be ₹ 60,000 or ₹ 70,000 or ₹ 80,000 or any other amount then the proposal is containing risk element. Further, in the same case, say, the proposal is expected to have the expected cash inflows of ₹ 20,000 at the end of year 1; ₹ 30,000 or ₹ 35,000 at the end of year 2; ₹ 10,000 or ₹ 25,000 at the end of year 3 and ₹ 25,000 or ₹ 30,000 at the end of year 4. In this case, the cash flows of year 1 is known with certainty but of year 2, year 3 and year 4 are uncertain and any one cash flow may occur out of the two values available for that year.

TYPES AND SOURCES OF RISK IN CAPITAL BUDGETING : The risk in a project can be classified into different groups such as the project itself, competition, shifts in the industry, international considerations *etc.*, as follows:

1. **Project Specific Risk :** This type of risk is project specific *i.e.*, an individual project may have higher or lower cash flows than expected, either because of the wrong estimations or because of factors specific to that project. When firms takes a large number of similar projects, it may be argued that much of this project specific risk would be diversified away.
2. **Competition Risk :** The second type of risk is competition risk where the cash flow of a project are effected by the actions of the competitors. Although, a good project analysis might consider the reactions of the competitors, the actual actions taken by the competitors may be different from those expected.
3. **Industry Specific Risk :** The third type of risk is the industry specific risk *i.e.*, the risk which primarily affect the earnings and cash flows of a specific industry only. This risk may arise because of three factors. The first is technology risk, which reflects the effects of technologies that change or evolve in ways different from those expected when the project was originally analyzed. The second is legal risk, which reflects the effect of changing laws and regulation affecting a particular industry only. The third may be the commodity risk, which reflects the effects of price changes in goods and services that are used or produced.
4. **International Risk :** A firm faces this type of risk when it takes on projects outside its domestic market. In such cases, the earnings and cash flows might be different than expected owing to exchange rate movements or political changes. Some of this risk may be diversified away by a firm in the normal course of business by taking on projects in different countries whose currencies may not all move in the same direction.
5. **Market Risk :** The last type of risk arises by the factors that affect essentially all companies and all projects, of course in varying degrees. For example, changes in interest rate structure will affect the projects already taken as well as those yet to be taken, both directly through the discount rate and indirectly through the cash flows. Other factors that affect all the projects may be inflation, economic conditions *etc.* Although the expected values of all these variable may be considered in the capital budgeting analysis, changes in these variables will effect their values. Firms cannot diversify away this risk in the normal course of business, although may be considered to some extent only.

Assumptions of Capital Budgeting under Risk : The discussion on capital budgeting under risky situations is based upon the following assumptions :

1. That the firm is not having any capital rationing, and no profitable project will be rejected for want of funds.
2. That the proposal's net investment is known with certainty.
3. Each set of cash flows is known with certainty, and is mutually exclusive and exhaustive.
4. The required rate of return of the firm is given and is indicative of the risk-return characteristics of the proposal.
5. The firm is basically risk-averse. This assumption is important as it implies that the finance manager will not accept a risky proposal unless its expected profits are sufficient to compensate for the risk. The risk aversion also means that the additional risk will be accepted only if it results in disproportionately larger increase in expected returns. This assumption of risk aversions can be expressed in terms of the following prepositions :
   (*a*) If the two proposals have the same expected return, then the proposal with lessor risk will be preferred, and
   (*b*) If two proposals have same degree of risk then proposal with the higher expected return will be preferred.

Incorporating Risk in the Capital Budgeting Analysis : In all the capital budgeting decisions, there is always an element of risk involved, which must be considered while evaluating different investment proposals. There are several techniques available to handle the risk perception of capital budgeting proposals. These techniques differ in their approach and methodology to incorporate risk in the evaluation process. Broadly speaking, these techniques can be grouped into conventional techniques and statistical techniques as follows :

Conventional Techniques	Statistical Techniques
1. Payback Period 2. Risk-Adjusted Discount Rate 3. Certainty Equivalents 4. Sensitivity Approach	1. Probability Distribution Approach 2. Simulation Analysis 3. Decision Tree Approach

However, in view of the limited scope of the text, only some of the conventional techniques are being discussed here.

CONVENTIONAL TECHNIQUES OF RISK ANALYSIS

These techniques are also known as traditional or non-mathematical techniques to evaluate risk. These approaches are simple and based on theoretical assumptions. Some of the conventional techniques are as follows :

PAYBACK PERIOD : As already discussed, the Payback Period method considers the time period over which the original investment in the project will be recovered by the firm out of the cash inflows of the project. The payback period is then compared with the target payback period. If the proposal's payback period is less than or equal to the target payback period, it may be accepted, otherwise rejected. In order to incorporate risk of the proposal, the target payback period may be shortened. As a result some project which would have been on the verge of being selected, otherwise, will now be rejected. The shortening of the target payback period is based

on the assumption that larger the recovery period, more risky the proposal would be.

The Payback Period as an approach to handle risk is simple and straightforward. But it fails to measure the risk which may be of different degree in different alternative proposals. Moreover, it reduces only that risk which arises due to time period and thus allows for other risks to prevail. The payback period also ignores the time value of money as well as the cash flows arising after the payback period.

Once the risk has been identified and measured for a proposal, it can be considered in capital budgeting analysis in one of the two ways :

1. To adjust the discount rate to reflect the risk, and
2. To adjust the cash flows to incorporate the risk and then to use a riskless discount rate.

Both these approaches have been discussed as follows :

RISK ADJUSTED DISCOUNT RATE (RADR) : An other way of adjusting for risk is to modify the rate of return to include a risk premium wherever needed. In a sense, the reasoning behind this is quite simple *i.e.*, the greater the risk, the higher should be the desired return from a proposal. The RADR approach to handle risk in a capital budgeting decision process is a more direct method. The RADR is based on the premise that riskiness of a proposal may be taken care of, by adjusting the discount rate. The cash flows from a more risky proposal should be discounted at a relatively higher discount rate as compared to other proposals whose cash flows are less risky.

Any investor is basically risk averse and try to avoid risk. However, he may be ready to take risk provided he is rewarded for undertaking risk by higher returns. So, more risky the investment is, the greater would be the expected return. The expected return is expressed in terms of discount rate which is also termed as the minimum required rate of return generated by a proposal if it is to be accepted. Therefore, there is a positive correlation between risk of a proposal and the discount rate.

A firm at any point of time has a risk level emanating from the existing investment. The firm also has a discount rate to reflect that level of risk. In case, there is no risk of the existing investment, then the present discount rate may be known as the risk free discount rate. If the risk level of the new proposal is higher than the risk level of the existing investment, then the discount rate to be applied to find out the present values of the cash flows of the proposal should also be higher than the present discount rate. Similarly, two different proposals having varying degree of risk should be evaluated at different discount rates. The difference between the discount rate applied to a riskless proposal and a risky proposal is known as the risk premium. The RADR may be expressed in terms of Equation 4.4.

$$k_a = k + \alpha \qquad (4.4)$$

where, k_a = Risk Adjusted Discount Rate

k = Risk free Discount Rate, and

α = Risk Adjustment Premium

It may be noted that the risk free discount rate is described as the rate of return on the government securities. Since all the business proposals have higher degree of risk as compared to zero degree of risk of government securities, the RADR is always greater than the risk free rate. Moreover, as the risk of a proposal increases the risk adjustment premium *i.e.*, α also increases.

Now, this RADR can be used to find out the risk adjusted NPV of the proposal as follows :

$$RANPV = \sum_{i=1}^{n} \frac{CF_i}{(1+k_a)^i} - C_0 \qquad (4.5)$$

where, RANPV = Risk Adjusted NPV

CF_i = Cash inflows occurring at different point of time.

C_0 = Initial cash outflow

k_a = Risk Adjusted Discount Rate.

It may be noted that the RADR approach to risk incorporation is the same as the NPV technique of capital budgeting. The only difference is that the rate of discount used in RADR *i.e.*, k_a is higher than the original discount rate *i.e.*, k. The RADR reflect the return that must be earned by a proposal to compensate the firm for undertaking the risk. The higher the risk of a proposal, the higher the RADR would be and therefore the lower the NPV of a given set of cash flows.

The accept-reject rule of the RANPV can be described as follows :

Accept the proposal if the RANPV is positive or even zero and reject the proposal if it is negative. In case of mutually exclusive proposals, the rule may be : Select the alternative which has the highest positive RANPV.

In case, the firm is applying the IRR technique for evaluation of capital budgeting proposals, then the IRR of the project can be compared with the RADR *i.e.*, the minimum required rate of return to accept or reject the proposal.

Evaluation of RADR Approach : The RADR approach is profit oriented, considers the time value of money and explicitly incorporates the risk involved in the project by making the discount rate as a function of the proposal's risk. The RADR helps finding out the expected future profits generated by a risky project over and above the RADR.

However, the RADR suffers from the basic shortcoming relating to the determination of the risk adjustment premium or the RADR itself. Moreover, the RADR as explained above does not adjust the future cash flows which are risky and uncertain. This shortcoming can be overcome by applying the probability distribution of cash flows. This aspect of probability distribution of cash flows has been taken up at a later stage.

CERTAINTY EQUIVALENTS (CE) : An alternative approach to incorporate the risk is to adjust the cash flows of a proposal to reflect the riskiness. The CE approach attempts at adjusting the future cash flows instead of adjusting the discount rates. The expected future cash flows which are taken as risky and uncertain are converted into certainty cash flows. Intuitively,

more risky cash flows will be adjusted down lower than will the less risky cash flows. The extent of adjustment will vary and it can be either subjective or based on a risk return model. These adjusted cash flows are then discounted at risk free discount rate to find out the NPV of the proposal. The procedure for the CE approach can be explained as follows :

1. Estimation of the future cash flows from the proposal. These cash flows do have some degree of risk involved.
2. The calculation of the CE factors for different years. These CE factors reflect the proportion of the future cash flow a finance manager would be ready to accept now in exchange for the future cash flows. The CE factors represent the level of present money at which the firm would be indifferent between accepting the present money or the future cash flows. For example, cash inflow of ₹ 10,000 is receivable after 2 years. However, if the inflow is available right now, the firm may be ready to accept even 70% of ₹ 10,000 *i.e.*, ₹ 7,000 only. This 70% or .7 is the CE factor. For different years the CE factors will be different to account for the timing as well as the varying degree of risk involved. It may be noted that higher the riskiness of a cash flow, the lower will be the CE factor.
3. The expected cash flows for different years as calculated in step 1 above are multiplied by the respective CE factors and the resultant figures are described as certainty equivalent cash flows.
4. Once all the cash flows are reduced to CE cash flows then these CE cash flows are discounted at risk free rate to find out the NPV of the proposal.

The CE approach may be described in terms of Equation 4.6.

$$RANPV = \sum_{i=1}^{n} \frac{\alpha_i \, CF_i}{(1+k_f)^i} - C_0 \qquad (4.6)$$

where, RANPV = Risk Adjusted NPV of the proposal

α_i = CE factors for different years

CF_i = Expected cash flows for different years

k_f = Risk free discount rate.

It may be noted that the value of α_i *i.e.*, the CE factors will vary between 0 and 1, and will vary inversely to risk. The greater the risk involve (may be due to time factor or otherwise) the lower will be the value of α. For example, the cash flows for next three years from a proposal are expected to be ₹ 20,000 each year and the CE factors may be taken at .9, .8 and .7 for three years respectively to denote the risk involved in the expected cash flows. Now, these cash inflows may be converted into certainty cash flows by multiplying by the respective CE factors. So, the certainty cash flows would be ₹ 18,000 (₹ 20,000 × .9), ₹ 16,000 (₹ 20,000 × .8) and ₹ 14,000 (₹ 20,000 × .7).

The CE factors can either be determined arbitrarily by the finance manager or the following ratio may be used.

$$\alpha = \frac{\text{Certainty Cash Flow}}{\text{Expected Cash Flow}}$$

The decision rule associated with the CE approach is that accept a proposal with positive CE NPV. In case of mutually exclusive proposals the rule is that the proposal having the highest positive CE NPV is accepted.

Evaluation of CE Approach : The CE approach explicitly recognizes the risk and incorporates it by deflating the cash flows to CE cash flows. This approach seems to be conceptually superior to the RADR and does not assume that risk increases over time at a constant rate. But the CE approach involves the determination of CE factors which is a tedious job.

If a firm is using IRR technique to evaluate the capital budgeting proposals, then the IRR of the CE cash flows can be calculated and compared with the minimum required rate of return to make an appropriate decision.

RADR *Versus* CE Approach : Both the RADR and the CE approach attempt to incorporate the project risk, of course, in a different way. The RADR incorporates the risk by increasing the discount rate *i.e.*, it deals with the denominator of the NPV formula. The CE approach incorporates the risk by deflating the expected cash flows to CE cash flows and so it deals with the numerator of the NPV formula. In case of RADR, there is an implied assumption that the risk of the proposal increases at a constant rate over the life of the project. On the other hand, the CE approach incorporates the different degrees of risk involved for different years.

The RADR tends to club together the risk free rate, the risk involved and the risk premium, while the CE approach maintains a distinction between the risk free rate and the risk. The discount rate in CE approach is taken as the risk free discount rate and is constant while the risk is incorporated by adjusting the cash flows.

It may be said therefore, that though both RADR and the CE approach attempt to incorporate the risk, yet they differ in their approach. The relative position of these two techniques have been presented in Figure 4.4. It may be noted that the Figure 4.4 shows that RADR converts the risky cash flows into present values in 1 stroke, while the CE approach makes separate adjustments for time and the risk.

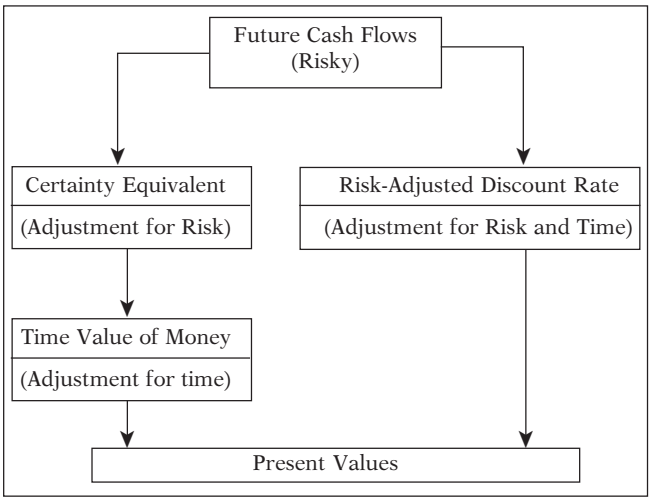

FIGURE 4.4 : RADR AND CE APPROACH TO RISKY CASH FLOWS.

SELECTING THE APPROPRIATE TECHNIQUE

In the preceding discussion, several techniques of evaluation of capital budgeting proposals have been discussed. Each of these techniques has its own decision rule. But how a decision maker has to select a particular technique of evaluation of capital budgeting proposals.

The PB technique ignores the time value of money, the timings of the cash flows and also the cash flows occurring after the payback period and fails to be a sound technique. But still it can definitely be used by firms which have overriding preferences or compulsions for early liquidity. It is uncommon for firms to make capital budgeting decisions solely on the basis of PB technique. However, firms are likely to employ the PB technique as a secondary rule either (*i*) as a constraint in decision making *e.g.*, accept projects that earn a return of at least, say, 15% as long as the payback is less than, say, 5 years, or (*ii*) as a way to choose between projects that score equally well on the primary decision rule, *e.g.*, when two mutually exclusive proposals have similar returns, choose the one with a lower payback.

The ARR technique would have been a good evaluation technique if the objective had been profit maximization instead of wealth maximization. Like the PB technique, the ARR technique also ignores the time value of money, timings of return besides ignoring the cash generations by tax shield of depreciation etc. Only in a case, when a firm is looking for a return from an investment in terms of profits contributed, the ARR may be applied.

The PI technique can be appropriately used by those firms which, in view of the funds constraints, are looking for proposals which will contribute more per rupee spent. Also, a finance manager can use the PI technique when he wants to evaluate the effect of future cash flows. However, since the PI technique does not consider the absolute accruals to the firm's wealth by a proposal, it fails to be in line with the objective of wealth maximization.

Both the NPV and the IRR impliedly enhance the wealth of the shareholders. These techniques are best suited for firms which are working for the objective of wealth maximization, since these techniques recognize the contribution generated by a proposal towards the wealth. These techniques can be applied if the firm is looking for the benefits being brought by the proposal to the firm.

In particular, the NPV technique is most appropriate for firms trying for the wealth maximization, by undertaking those projects which are expected to generate maximum additional present values. The NPV technique is also suitable to those firms which are interested in ranking of various proposals in order of 'addition' expected from these proposals. The NPV is the most clear indication of the additional value created by a proposal. The NPV technique seems to be the most in line with the objective of wealth maximization. As per the NPV technique, the value of the firm should increase as it continues to add further projects with positive NPVs. The firm should take as many projects with the positive NPVs as possible.

Obviously, none of the criteria is applicable to all the situations all the time. A firm needs to use more than one criterion in evaluating any set of capital budgeting proposals. It may rank different proposals as per the NPV technique but the benefit per rupee invested (PI technique) may also be considered. Moreover, all the discounted cash flow techniques are related in such a way that if one technique indicates the acceptance of a proposal, then all other techniques are also likely to indicate the same way. In most of the cases, if a proposal has positive NPV, it will also have PI $>$ 1 and the IRR $>$ the cutoff rate.

Sometimes, these evaluation techniques develop and present an interpretational problem due to peculiarities of the situation to which they are applied. These problems, however, do not affect their existence as evaluation techniques of capital budgeting decision process. What is required in such situations is to make minor adjustment to the basic technique.

POINTS TO REMEMBER

- After the estimation of cashflows associated with different proposals, these proposals are evaluated. The selection of a proposal is, no doubt, made in the light of objective of maximization of wealth of shareholders.
- There are different techniques of evaluation of capital budgeting proposals. These may be classified as (*i*) Traditional techniques and (*ii*) Discounted cashflows techniques.
- There are two traditional techniques. These are Payback Period and Accounting Rate of Return. Both these techniques are simple in approach but suffer from one or the other shortcoming.
- Net Present Value and the Internal Rate of Return are two basic techniques of evaluation based on Discounted cashflows.
- There is Profitability Index method which may be taken as a variant of NPV. An improvisation of IRR is made in terms of MIRR Method.
- Both the NPV and IRR techniques are comprehensive and sound evaluation techniques. Both aims at maximization of wealth of shareholders. NPV is often regarded as a better technique of evaluation.
- However, the NPV and IRR differ with respect to the reinvestment rate assumption. In most of the cases, these two methods give same ranking of mutually exclusive proposals, but in certain cases, they may give different ranking also.
- All the discounted cashflows techniques allow for time value of money, give clear cut decision rules and consider all the cashflows associated with a proposal.
- Replacement Decisions are revaluated on the basis of Incremental cash flows.
- For Accept-Reject situations, the rule is: "All the good ones are accepted."
- For mutually exclusive cases, the rule is: "Only the best one is selected."

GRADED ILLUSTRATIONS

Illustration 4.1

ITC Ltd. has decided to purchase a machine to augment the company's installed capacity to meet the growing demand for its products. There are three machines under consideration of the management. The relevant details including estimated yearly expenditure and sales are given below: All sales are on cash. Corporate Income Tax rate is 30%.

	Machine 1	Machine 2	Machine 3
Initial investment required	₹ 3,00,000	₹ 3,00,000	₹ 3,00,000
Estimated annual sales	5,00,000	4,00,000	4,50,000
Cost of Production (estimated):			
Direct Materials	40,000	50,000	48,000
Direct Labour	50,000	30,000	36,000
Factory Overheads	60,000	50,000	58,000
Administration costs	20,000	10,000	15,000
Selling and distribution costs	10,000	10,000	10,000

The economic life of Machine 1 is 2 years, while it is 3 years for the other two. The scrap values are ₹ 40,000, ₹ 25,000, and ₹ 30,000 respectively. You are required to find out the most profitable investment based on 'Pay Back Method'.

Solution :

Calculation of Pay Back Period of Machines :

	Machine 1	Machine 2	Machine 3
Initial investment (A)	₹ 3,00,000	₹ 3,00,000	₹ 3,00,000
Sales (B)	5,00,000	4,00,000	4,50,000
Costs :			
Direct Material	40,000	50,000	48,000
Direct Labour	50,000	30,000	36,000
Factory Overhead	60,000	50,000	58,000
Depreciation	1,30,000	91,667	90,000
Administration Cost	20,000	10,000	15,000
Selling and Distribution costs.	10,000	10,000	10,000
Total Cost (C)	3,10,000	2,41,667	2,57,000
Profit before Tax (B-C)	1,90,000	1,58,333	1,93,000
Less: Tax @ 30%	57,000	47,500	57,900
Profit after Tax	1,33,000	1,10,833	1,35,100
Add: Depreciation	1,30,000	91,667	90,000
Net Cash flow (D)	2,63,000	2,02,500	2,25,100
Pay back period (years) (A÷D)	1.14	1.48	1.33

Machine I has lowest pay back period, so it may be preferred over the other two Machines.

Illustration 4.2

XYZ Ltd. has to replace one of its machine for which it has following options:

(*a*) Installation of equipment "Best" having cost of ₹ 75,000 which is expected to a generate a cash inflow of ₹ 20,000 per annum for next 6 years.

(*b*) Installation of equipment "Better" having cost of ₹ 50,000 which is expected to generate a cash inflow of ₹ 18,000 per annum for next 4 years.

Which equipment should be preferred if the company adopts method of (*i*) Payback period (*ii*) Internal Rate of Return.

Solution :

Payback Period:

Payback period of equipment "Best" is :
₹ 75,000 ÷ 20,000 = 3.75 years

Payback period of equipment "Better" is :
₹ 50,000 ÷ 18,000 = 2.78 years

So, equipment "Better", having lower payback period of 2.78 years may be preferred.

Internal Rate of Return Method :

Equipment "Best" :

Initial outlay = ₹ 75,000
Inflows = ₹ 20,000 per year for 6 years.
$PVAF_{(\%,6)}$ = ₹ 75,000/20,000 = 3.75

In the PVAF Table, the values nearest to 3.75 in the 6 year row are found in 15% (3.784) and 16% (3.685) column. Now, the IRR may be found by interpolating between 15% and 16% as follows :

$$= 15\% + \frac{3.784 - 3.750}{3.784 - 3.685} \times 1 = 15.34\%$$

Equipment "Better" :

Initial outlay = ₹ 50,000
Inflows = Rs 18,000 per year for 4 years
$PVAF_{(\%,4)}$ = ₹ 50,000/18,000 = 2.778

In the PVAF Table, the values nearest to 2.778 in the 4 year row are found in 16% (2.798) and 17% (2.743) column. Now, the IRR may be found by interpolating between 16% and 17% as follows :

$$= 16\% + \frac{2.798 - 2.778}{2.798 - 2.743} \times 1 = 16.36\%$$

The equipment "Better", having IRR of 16.36% may be preferred over the equipment "Best".

Illustration 4.3

Machine A costs ₹ 1,00,000 payable immediately. Machine B costs ₹ 1,20,000 half payable immediately and half payable in one year's time. The cash receipts expected are as follows:

Year (at end)	Machine A	Machine B
1	₹ 20,000	—
2	60,000	₹ 60,000
3	40,000	60,000
4	30,000	80,000
5	20,000	—

At 7% opportunity cost, which machine should be selected on the basis of NPV?

Solution :

1. Calculation of NPV

	Machine A			Machine B		
Year	Cash flows	$PVF_{(7\%n)}$	PV(₹)	Cash flows	$PVF_{(7\%n)}$	PV(₹)
0	–₹ 1,00,000	1.000	–1,00,000	–₹ 60,000	1,000	–60,000
1	20,000	.935	.18,700	– ₹ 60,000	.935	–56,100
2	60,000	.873	52,380	60,000	.873	52,380
3	40,000	.816	32,640	60,000	.816	48,960
4	30,000	.763	22,890	80,000	.763	61,040
5	20,000	.713	14,260	—	—	—
NPV			40,870			46,280

Machine B is having higher : NPV and may be selected.

Illustration 4.4

A company is considering a new project for which the investment data are as follows:

Capital outlay ₹ 2,00,000

Depreciation 20% p.a.

Forecasted annual income before charging depreciation, but after all other charges are as follows:

Year 1	₹ 1,00,000
2	1,00,000
3	80,000
4	80,000
5	40,000
	4,00,000

On the basis of the available data, set out calculations, illustrating and comparing the following methods of evaluating the return :

(*a*) Payback method.

(*b*) Rate of return on original investment.

Solution :

Since there is no tax, the annual income before depreciation and after other charges is equivalent to Cash flows (CF).

(*a*) Capital outlay of ₹ 2,00,000 is recovered in the first two years, (₹ 1,00,000 (year 1) + Rs 1,00,000 (year 2), therefore, the pay-back period is two years.

(*b*) Rate of return on original investment:

Year	Income (₹)	Depreciation (₹)	Net income (₹)
1	1,00,000	40,000	60,000
2	1,00,000	40,000	60,000
3	80,000	40,000	40,000
4	80,000	40,000	40,000
5	40,000	40,000	—
			2,00,000

Average Income = ₹ 2,00,000/5 = ₹ 40,000

$$\text{Rate of Return} = \frac{\text{Average income}}{\text{Original investment}} \times 100$$

$$= \frac{₹\ 40,000}{₹\ 2,00,000} \times 100 = 20\%$$

Illustration 4.5

A company has to consider the following Project:

Cost ₹ 10,000

Cash inflows :

Year	1	₹ 1,000
	2	1,000
	3	2,000
	4	10,000

Compute the internal rate of return and comment on the project if the opportunity cost is 14%.

[*B. Com.(H.), D.U. 2009*]

Solution:

Internal Rate of Return:

Cost = ₹ 10,000

Cash Inflows = ₹ 1000,1000, 2000, 10,000

Average Inflow = (₹ 1000 + 1000 + 2000 + 10,000) ÷ 4

= ₹ 3500

Approximate Pay-back period = 10,000 ÷ 3500 = 2.857.

In the PVAF table, value near to 2.857 for 4 years is found in 15%. However, as the cash inflows in the earlier years are lower, the NPV may be found at 10% and 11% as follows :

Calculation of IRR:

Year	Cash inflows	$PVF_{(10\%n)}$	PV(₹)	$PVF_{(11\%n)}$	PV (₹)
1	₹ 1,000	.909	909	.901	901
2	1,000	.826	826	.812	812
3	2,000	.751	1,502	.731	1,462
4	10,000	.683	6,830	.659	6,590
Total PV of Inflows			10,067		9,765
NPV of the Proposal			67		–235

IRR may be found by interpolation between 10% and 11% as follows:

$$\text{IRR} = 10\% + \frac{67}{67 - (-235)} \times (11 - 10)$$

$$= 10\% + .22 = 10.22\%$$

As the opportunity cost of the firm is 14%, the project having IRR of 10.22% should be rejected.

Illustration 4.6

XYZ Ltd. is considering two additional mutually exclusive projects. The after-tax cash flows associated with these projects are as follows:

Year	Project A	Project B
0	₹ 1,00,000	₹ 1,00,000
1	32,000	0
2	32,000	0
3	32,000	0
4	32,000	0
5	32,000	Rs. 2,00,000

The required rate of return on these projects is 11% :

(*a*) What is each project's net present value?

(*b*) What is each project's internal rate of return?

(*c*) What has caused the ranking conflict?

(*d*) Which project should be accepted? Why?

[*B.Com. (H.), D.U., 2012*]

Solution:

Calculation of NPV :

Project A :

Annual Inflow	₹ 32,000
$PVAF_{(11,5)}$	3.696
PV of Inflows	₹ 1,18,272
Less: Outflow	1,00,000
Net Present Value	₹ 18,272

Project B:

Inflow after 5th year	₹ 2,00,000
$PVF_{(11,5)}$	.593
PV of Inflow	1,18,600
Less: Outflow	1,00,000
Net Present Value	₹ 18,600

Calculation of Internal Rate of Return :

Project A:

NPV @ 18% [(32000 × 3.127) – 1,00,000]	64
NPV @ 19% [(32000 × 3.058) – 1,00,000]	– 2,144

Interpolation:

$$IRR = 18\% + \frac{64}{64 - (-2144)} \times 1 = 18.03\%$$

Project B:

NPV @ 14% [(2,00,000 × .519) – 1,00,000]	3,800
NPV @ 15% [(2,00,000 × .497) – 1,00,000]	– 600

Interpolation :

$$IRR = 14\% + \frac{3800}{3800 - (-600)} = 14.46\%$$

Difference in Ranking:

According to NPV method, Project B is better which the IRR method suggests for Project A. Difference in ranking of projects arises because of difference in patterns of inflows. However, Project A should be accepted. The reason being that the NPV of two projects are not much different but IRR of Project A is definitely higher than that B.

Illustration 4.7

A firm whose cost of capital is 10% is considering two mutually exclusive projects X and Y, the details of which are :

	Year	Project X	Project Y
Cost	0	₹ 1,00,000	₹ 1,00,000
Cash inflows	1	10,000	50,000
	2	20,000	40,000
	3	30,000	20,000
	4	45,000	10,000
	5	60,000	10,000

Compute the Net Present Value at 10%, Profitability Index, and Internal Rate of Return for the two projects.

[*B.Com.(H), D.U., 2012*]

Solution :

Calculation of NPV:

Year	CF (₹) X	CF (₹) Y	$PVF_{(10\%,n)}$	Total PV (₹) X	Total PV (₹) Y
1	10,000	50,000	0.909	9,090	45,450
2	20,000	40,000	0.826	16,520	33,040
3	30,000	20,000	0.751	22,530	15,020
4	45,000	10,000	0.683	30,735	6,830
5	60,000	10,000	0.621	37,260	6,210
Total PV				1,16,135	1,06,550
Less cash outflow				1,00,000	1,00,000
NPV				16,135	6,550
PI = (PV of Inflows/PV of Outflows)				1.161	1.065

Calculation of IRR:

$$\text{Payback value} = \frac{\text{Initial cash outlays}}{\text{Average cash inflows}}$$

$$\text{Project X} = \frac{₹\ 1,00,000}{₹\ 33,000} = 3.030$$

$$\text{Project X} = \frac{₹\ 1,00,000}{₹\ 26,000} = 3.846$$

The PVAF table indicates that for Project X, the PV Factor closest to 3.030 against 5 years is 3.058 at 19% and for Project Y, the PV factor closest to 3,846 is 3.890 at 9%. In the case of Project X, since CF in the initial years are considerably smaller than the average cash flows, the IRR is likely to be much smaller than 19%. In the case of Project Y, CF in the initial years are considerably larger than the average cash flows, the IRR is likely to be much higher than 9%. So, Project X may be tried at 14% and 15% and the Project Y may be tried at 13% and 14%.

Project X

Year	CF(₹)	PV Factors 14%	PV Factors 15%	Total PV(₹) 14%	Total PV(₹) 15%
1	10,000	0.877	0.870	8,770	8,700
2	20,000	0.769	0.756	15,380	15,120
3	30,000	0.675	0.658	20,250	19,740
4	45,000	0.592	0.572	26,640	25,740
5	60,000	0.519	0.497	31,140	29,820
				1,02,180	99,120

By interpolation between 14% and 15%, the IRR comes to 14.71%.

Project Y

Year	CF(₹)	PV Factors 13%	PV Factors 14%	Total PV(₹) 13%	Total PV(₹) 14%
1	50,000	0.885	0.877	44,250	43,850
2	40,000	0.783	0.769	31,320	30,760
3	20,000	0.693	0.675	13,860	13,500
4	10,000	0.613	0.592	6,130	5,920
5	10,000	0.543	0.519	5,430	5,190
				1,00,990	99,220

By interpolation between 13% and 14%, the IRR comes to 13.56%. The results of the above calculations may be summarized as follows :

	Project X	Project Y
NPV	₹ 16,135	₹ 6,550
PI	1.161	1.065
IRR	14.71%	13.56%

Illustration 4.8

A company requires an initial investment of ₹ 40,000. The estimated net cash flow are as follows:

(Figures in ₹)

Year	1	2	3	4	5	6	7	8	9	10
Net cash flow	7,000	7,000	7,000	7,000	7,000	8,000	10,000	15,000	10,000	4,000

Using 10% as the cost of capital (rate of discount), determine the following :

(*i*) Pay-back period (*ii*) Net Present Value and (*iii*) Internal Rate of Return.

Solution:

(i) Payback Period :

Initial outlay	₹ 40,000
Cashflows for 5 years	₹ 7,000 + 7,000 + 7,000 + 7,000 + 7,000 = ₹ 35,000
Balance outlay	= ₹ 40,000 – 35,000 = 5,000
Cashflow for year 6	= ₹ 8,000

$$\text{Therefore, Payback period} = 5\,\text{years} + \frac{5{,}000}{8{,}000} = 5.62\,\text{years.}$$

(ii) Net Present Value (at 10% of cost of capital)

Year	Cashflow	$PVF_{(10\%n)}$	PV
1	₹ 7,000	.909	₹ 6,363
2	7,000	.826	5,782
3	7,000	.751	5,257
4	7,000	.683	4,781
5	7,000	.621	4,347
6	8,000	.564	4,512
7	10,000	.513	5,130
8	15,000	.467	7,005
9	10,000	.424	4,240
10	4,000	.386	1,544
	Total inflows		48,961
	Less Initial outlay		40,000
	Net Present Value		8,961

(iii) Internal Rate of Return (IRR)

The NPV at 10% has been found to be Rs 8,961. So, in order to find out IRR, the cash flows may now be discounted at say 14% and 15%, as follows :

Year	Cashflows	$PVF_{(14\%,n)}$	PV	$PVF_{(15\%,n)}$	PV
1	₹ 7,000	.877	₹ 6,139	.870	₹ 6,090
2	7,000	.769	5,383	.756	5,292
3	7,000	.675	4,725	.658	4,606
4	7,000	.592	4,144	.572	4,004
5	7,000	.519	3,633	.497	3,479
6	8,000	.456	3,648	.432	3,456
7	10,000	.400	4,000	.376	3,760
8	15,000	.351	5,265	.326	4,905
9	10,000	.308	3,080	.284	2,840
10	4,000	.270	1,080	.247	988
	Total inflows		41,097		39,420
	Less Initial outlay		40,000		40,000
	Net Present Value		1,097		– 580

At 14% NPV is ₹ 1097, and At 15% NPV is ₹ –580

The IRR may be found by interpolating between 14% and 15% as follows:

$$\text{IRR} = 14\% + \frac{1{,}097}{1{,}097 - (-580)}$$

$$= 14\% + .65 = 14.65\%$$

Illustration 4.9

XYZ Ltd. is considering the introduction of a new product. If is estimated that profits before depreciation would increase by ₹ 1,20,000 each year for first four years and ₹ 60,000 each for the remaining period. An advertisement cost of ₹ 20,000 is expected to be incurred in the first year, which is not included in the above estimate of profits. The cost will be allowed for tax purpose in the first year.

A new plant costing ₹ 2,00,000 will be installed for the production of the new product. The salvage value of the plant after its life of 10 years is estimated to be ₹ 40,000. A working capital investment of ₹ 20,000 will be required in the year of installing the plant and a further ₹ 15,000 in the following year. The company's tax rate is 30% and it claims written down value depreciation at 33.33%. If the company's required rate of return is 20%, should the company introduce the new product ? Ignore tax effect on Profit/Loss on sale of asset.

Solution:

Calculation of NPV @20% :

Year	PBDep.	Dep.	PBT	PAT	CF	$PVF_{(20\%,n)}$	PV
1	₹ 1,00,000	₹ 66,667	₹ 33,337	₹ 23,336	₹ 90,003	.833	₹ 74,972
2	1,20,000	44,445	75,555	52,888	97,333	.694	67,549
3	1,20,000	29,630	90,370	63,259	92,889	.579	53,783
4	1,20,000	19,753	1,00,247	70,173	89,926	.482	43,344
5	60,000	13,169	46,831	32,782	45,951	.402	18,472
6	60,000	8,779	51,221	35,855	44,634	.335	14,952

Year	PBDep.	Dep.	PBT	PAT	CF	$PVF_{(20\%,n)}$	PV
7	60,000	5,853	54,147	37,903	43,756	.279	12,208
8	60,000	3,902	56,098	39,269	43,171	.233	10,059
9	60,000	2,601	57,399	40,179	42,780	.194	8,299
10	60,000	1,734	58,266	40,786	42,520	.162	6,888
10	Working Capital released				35,000	.162	5,670
10	Scrap Value of the plant				40,000	.162	6,480
	Present Value of Inflows						3,22,676

(***Note :*** Profit for the year 1 has been taken as ₹ 1,00,000 *i.e.,* ₹ 1,20,000–20,000. The amount of advertisement expenses of ₹ 20,000 has been deducted to find out net cash inflow for that year.)

Present Value of Outflows :

Initial outflow	₹ 2,00,000
Working Capital Required at T_o	20,000
Working Capital required at T_1 (₹ 15,000×.833)	12,495
	2,32,495

NPV = PV of Inflows – PV of Outflows
= ₹ 3,22,676–2,32,495
= ₹ 90,181

The proposal has a positive NPV and hence may be acceptable.

Illustration 4.10

Bright Matels Ltd. is considering two different investment proposals, A and B. The details are as under:

		Proposal A	Proposal B
Investment Cost		₹ 9,500	₹ 20,000
Estimated Income :	Year 1	4,000	8,000
	Year 2	4,000	8,000
	Year 3	4,500	12,000

Suggest the most attractive proposal on the basis of the NPV method considering that the future incomes are discounted at 12%. Also find out the IRR of the two proposals.

Solution :

Evaluation of Investment Proposal (Net Present Value Method):

Year	Cash inflows (₹)		$PVF_{(12\%\,n)}$	Present Value (₹)	
	A	B		A	B
0	–9,500	–20,000	1.000	–9,500	–20,000
1	4,000	8,000	0.893	3,572	7,144
2	4,000	8,000	0.797	3,188	6,376
3	4,500	12,000	0.712	3,204	8,544
	Net Present Value (NPV)			464	2,064

NPV is more in Proposal B and therefore, it should be accepted.

Calculation of Internal Rate of Return : In case of Proposal A, the discount factor should be raised from 12% and tested at, say, 14% and 15%. Similarly, for B the same should be tried at, say, 17% and 18%. The purpose is to find out at what point the present value of inflows are equal to ₹ 9,500 and ₹ 20,000.

Project A

NPV @ 12% ₹ 464
NPV @ 14% ₹ 122
NPV @ 15% ₹ –35
Interpolation between 14% and 15%

$$IRR = 14\% + \frac{122}{122-(-35)} \times 1$$

IRR = 14% + .78 = 14.78%

Project B

NPV @ 12% ₹ 2064
NPV @ 17% ₹ 176
NPV @ 18% ₹ –172
Interpolation between 17% and 18%

$$IRR = 17\% + \frac{176}{176-(-172)} \times 1$$

IRR = 17% + .51 = 17.51%

Illustration 4.11

A company is considering which of two mutually exclusive projects it should undertake. The finance director thinks that the project with higher NPV should be chosen as both projects have the same initial outlay and length of life. The company anticipates a cost of capital of 10% and the net after tax cash flows of the project are as follows :

(₹ '000)

Year	*0*	*1*	*2*	*3*	*4*	*5*
Project X	–210	40	80	90	75	25
Project Y	–210	222	10	10	6	6

Compute :

(*i*) The NPV and PI of each project.

(*ii*) State with reasons which project you would recommend.

[*B.Com.(H), D.U. 2011*]

Solution :

Calculation of NPV : **(Figures in ₹)**

Year	CF_X	CF_Y	$PVF_{10,\,n}$	PV_X	PV_Y
1	40,000	2,22,000	.909	36,360	2,01,798
2	80,000	10,000	.826	66,080	8,260
3	90,000	10,000	.751	67,590	7,510
4	75,000	6,000	.683	51,525	4,098
5	25,000	6000	.621	15,525	3,726
PU of Inflows				2,36,780	2,25,392
Less: Initial Cost				2,10,000	2,10,000
Net present Value				26,780	15,392

Calculation of PI:

$$\text{Project X} = \frac{\text{PV of Inflows}}{\text{Initial Cost}} = \frac{₹\,2,36,780}{₹\,2,10,000} = 1.127$$

$$\text{Project Y} = \frac{\text{PV of Inflows}}{\text{Initial Cost}} = \frac{₹\,2,25,392}{₹\,2,10,000} = 1.073$$

As per the NPV and PI methods, Project X should be preferred. However, Project Y has a very long inflow in the first year itself. So, the risk level of Project Y is lower, and a firm may prefer even Project Y.

Illustration 4.12

A company is engaged in evaluating an investment project which requires an initial cash outlay of ₹ 2,50,000 on equipment. The project's economic life is 10 years and its salvage value ₹ 30,000. It would require current assets of ₹ 50,000. An additional investment of ₹ 60,000 would also be necessary at the end of five years to restore the efficiency of the equipment. This would be written off completely over the last five years. The project is expected to yield annual profit (before tax) of ₹ 1,00,000. The company follows the sum of the years' digit method of depreciation. Income-tax rate is assumed to be 40%. Should the project be accepted if the minimum required rate of return is 20% ?

Solution :

Calculation of Present Values

Year	EBIT (₹)	Dep. (₹)	PBT(₹)	PAT(₹)	CF(₹)	$PVF_{(15\%)}$	PV(₹)
1	1,00,000	40,000	60,000	36,000	76,000	.833	63,308
2	1,00,000	36,000	64,000	38,400	74,400	.694	51,634
3	1,00,000	32,000	68,000	40,800	72,800	.579	42,151
4	1,00,000	28,000	72,000	43,200	71,200	.482	34,318
5	1,00,000	24,000	76,000	45,600	69,600	.402	27,979
6	1,00,000	40,000	60,000	36,000	76,000	.335	25,460
7	1,00,000	32,000	68,000	40,800	72,800	.279	20,311
8	1,00,000	24,000	70,000	45,600	69,600	.233	16,217
9	1,00,000	16,000	84,000	50,400	66,400	.194	12,882
10	1,00,000	8,000	92,000	55,200	63,200	.162	10,238
							3,04,498

PV of Cash Outflows (₹)		PV of Cash Inflows (₹)		
Initial cost	2,50,000	Annual Inflows		3,04,498
Current assets	50,000	Salvage value	30,000	
Investment–₹ 60,000× $PVF_{(20\%5y)}$	24,120	Current assets	50,000	
		$PVF_{(20\%10y)} \times 80,000$		12,960
Total	3,24,120	Total		3,17,458

The NPV of the proposal, therefore, is ₹ 3,17,458–₹ 3,24,120 = ₹ –6,662. Since the NPV of the proposal is negative, the proposal needs to be rejected.

Working Notes :

1. The depreciation of different years have been calculated as per sum of the year's digit method as follows : Initial outlay – Salvage value *i.e.,* ₹ 2,50,000–₹ 30,000 is to be depreciated over 10 years. The sum of the years digits for the years 1 - 10 is 55. So, depreciation for year 1 is ₹ 2,20,000 × (10/55) and for the year 2 it is 2,20,000 × (9/55) and so on. The total depreciation for first 5 years is ₹ 1,60,000 and so the written down value of the asset at the end of year 5, is ₹ 90,000 (*i.e.,* ₹ 2,50,000 - 1,60,000). A capital expenditure of ₹ 60,000 is required at that stage. So, the total cost required to be depreciated is ₹ 1,20,000 (*i.e.,* 90,000 + 60,000 – 30,000) and as per the sum of the years digit method for 5 years (*i.e.,* remaining life), the depreciation for the year 6 is ₹ 1,20,000 × (5/15), for year 2 is ₹ 1,20,000 × (4/15) and so on.
2. The cash flows for different years have been calculated as Profits after Tax + depreciation.
3. The current assets of ₹ 50,000 would be released at the end of year 10 and therefore, it has been included in the inflow of year 10.

Illustration 4.13

The cash flows from two mutually exclusive Projects A and B are as under:

Years	Project A	Project B
0	₹ –22,000	₹ –27,000
1–7 (Annual)	6,000	7,000
Project Life	7 Years	7 Years

(*i*) Calculate NPV of the proposals at different discount rates of 15%, 16%, 17%, 18%, 19% and 20%.

(*ii*) Advise on the project on the basis of IRR method.

Solution :

Computation of Present Value of Cash Inflows of Different Projects.

Dis.Rate	Cash Flow (₹)		$PVAF_{(r\%,7y)}$	PV Cash flows (₹)	
	Proj.A	Proj.B		Proj.A	Proj.B
15%	6,000	7,000	4.160	24,960	29,120
16%	6,000	7,000	4.040	24,240	28,280
17%	6,000	7,000	3.922	23,532	27,454
18%	6,000	7,000	3.812	22,872	26,684
19%	6,000	7,000	3.706	22,235	25,942
20%	6,000	7,000	3.605	21,630	25,235

Calculation of NPV:

Dis. Rate	PV of Inflows(A)	NPV(A)	PV of Inflows(B)	NPV(B)
15%	₹ 24,960	₹ 2,960	₹ 29,120	₹ 2,120
16%	24,240	2,240	28,280	1,280
17%	23,532	1,532	27,454	454
18%	22,872	872	26,784	–216
19%	22,235	235	25,942	–1,058
20%	21,630	–370	25,235	–1,765

Calculation of IRR:

Project A : Since outflow of ₹ 22,000 is falling between ₹ 22,235 and ₹ 21,630, the IRR must be between 19% to 20%. So, interpolating the difference of ₹ 605 between 19% and 20%, the IRR comes to 19.39%.

$$= 19\% + \frac{235}{235 - (-370)} \times (20 - 19) = 19.39\%$$

Project B : Since outflow of ₹ 27,000 is falling between ₹ 27,454 and ₹ 26,684, the IRR must be between 17% to 18%. So, interpolating the difference of ₹ 770 between 17% and 18%, the IRR comes to 17.59%.

$$= 17\% + \frac{454}{454 - (-216)} \times (18 - 17) = 17.59\%$$

Conclusion : As per the NPV technique, the Project A is acceptable even if the discount rate is as high as 19%, whereas, the Project B becomes unviable even at 18%. As per IRR technique, the Project A is acceptable and is having an IRR of 19.39% against the IRR of 17.59% of Project B.

Illustration 4.14

Delhi Machinery Manufacturing Company wants to replace the manual operations by new machine. There are two alternative models X and Y of the new machine. Using Payback period, suggest the most profitable investment. Ignore taxation.

	Machine X	Machine Y
Original Investment (₹)	9,000	18,000
Estimated life of the Machine (Years)	4	5
Estimated Savings in Cost (₹)	500	800
Estimated Savings in Wages (₹)	6000	8000
Additional Cost of Maintenance (₹)	800	1000
Additional Cost of Supervision (₹)	1200	1800

Solution :

	Machine X	Machine Y
Estimated Savings in Cost	₹ 500	₹ 800
Estimated Savings in Wages	6,000	8,000
	6,500	8,800
–Additional Cost of Maintenance	800	1,000
–Additional Cost of Supervision	1,200	1,800
	2,000	2,800
Net Inflow (Annual)	4,500	6,000
	9,000	18,000
Payback Period	4,500	6,000
	= 2 years	= 3 years

Machine X having lower Payback period of two years may be accepted.

Illustration 4.15

RST is evaluating two mutually exclusive proposals, A and B, Following information is available about these projects:

	Project A	Project B
Project Cost	₹ 5,00,000	₹ 7,00,000
Annual Cash Expenses	₹ 1,00,000	₹ 1,20,000
Life	10 years	10 years
Salvage Value	₹ 80,000	₹ 1,00,000

Other Information : Tax rate 40%, Required Rate of Return 12%; Evaluate the proposals on the basis of incremental Cash flows. (Proposal B over Proposal A).

Solution:

The incremental cash flows (B over A) are as follows:

	Project A	Project B	B over A
Initial Cost	₹ 5,00,000	₹ 7,00,000	–2,00,000
Annual Expenses	1,00,000	1,20,000	+20,000
Depreciation (p.a.)	42,000	60,000	+18,000
Annual deductible Exp.	1,42,000	1,80,000	+38,000
Annual tax saving @ 40%	56,800	72,000	15,200
Net outflow (Exp. – Tax Saving)	43,200	48,000	4,800
Terminal Inflow	80,000	1,00,000	+20,000
Calculation of NPV:			
PV of Annual Outflows (43,200 × 5.65), (48000 × 5.65)	2,44,080	2,71,200	27,120
Initial Cost	5,00,000	7,00,000	2,00,000
Total outflows (P.V.)	7,44,080	9,71,200	2,27,120
Less PV of Salvage	25,760	32,200	6,440
Net Present Value	–7,18,320	–9,39,000	–2,20,680

As the proposal B has negative NPV over A, the Proposal A should be preferred by the company.

Illustration 4.16

The Eastern Corporation Ltd., a firm in the 30% tax bracket with a 15% required rate of return, is considering a new project. This project involves the introduction of a new product. This project is expected to last five years and then to be terminated. Given the following information, determine the after-tax cash flows associated with the project and then find the project's net present value and advise the company whether it should invest in the project or not.

Cost of new Plant and Equipment : ₹ 20,90,000

Shipping and Installation Cost : ₹ 30,000

Unit Sales :

Year	Units Sold
1	10,000
2	13,000
3	16,000
4	10,000
5	6,000

Sales Price per unit: ₹ 500/unit in years 1–4 and ₹ 380/unit in year 5

Variable Cost per unit : ₹ 260/unit

Working Capital Requirements : There will be an initial working capital requirement of ₹ 80,000 just to get production started. For each year, the total investment in net working capital will be equal to 10% of the rupee value of sales for that year. Thus, the investment in working capital will increase during years 1 through 3, then decrease in year 4. Finally, all working capital is liquidated at the termination of the project at the end of year 5.

Depreciation method : Use straight-line method for providing depreciation over five years assuming that the plant and equipment will have no salvage value after five years.

[*B.Com. (H.), D.U. 2010*]

Solution:

Initial Outflow :

Cost of Machine	₹ 20,90,000
Installation Cost	30,000
Initial WC requirement	80,000
WC required for Year 1	5,00,000
	27,00,000

Subsequent Annual Inflows:

	Year 1	Year 2	Year 3	Year 4	Year 5
Sales (No. of Units)	10,000	13,000	16000	10,000	6,000
Selling Price (₹)	500	500	500	500	380
Sales (₹)	50,00,000	65,00,000	80,00,000	50,00,000	22,80,000
Less: VC @ ₹ 260	26,00,000	33,80,000	41,60,000	26,00,000	15,60,000
Less: Depreciation (₹)	4,24,000	4,24,000	4,24,000	4,24,000	4,24,000
Profit before tax (₹)	19,76,000	26,96,000	34,16,000	19,76,000	2,96,000
–Tax @ 30%	5,92,800	8,08,800	10,24,800	5,92,800	88,800
Profit after Tax (₹)	13,73,200	18,87,200	23,91,200	13,83,200	2,07,200
+ Depreciation	4,24,000	4,24,000	4,24,000	4,24,000	4,24,000
Operating CF (1)	17,97,200	23,11,200	28,15,200	18,07,200	6,31,200
WC Requirement for (n + 1) year	6,50,000	8,00,000	5,00,000	2,28,000	—
Change in WC (2)	+ 1,50,000	+ 1,50,000	–3,00,000	–2,72,000	–3,08,000
Net Cash Flow (1–2)	16,47,200	21,61,200	31,15,200	20,79,200	9,39,200
$PVF_{(15,n)}$	.870	.756	.658	.572	.497
Present Value	14,33,064	16,33,867	20,49,802	11,89,302	4,66,782

Total Present Value	₹ 67,72,817
Less: Initial Outflow	27,00,000
Net Present Value	40,72,817

As the NPV of the proposal in positive, it can be taken up.

Notes :

1. Depreciation = (20,90,000 + 30,000)/5 = ₹ 4,24,000
2. For year 1, WC of ₹ 5,00,000 is required in the beginning.
3. For other years, change in WC is = New WC – Existing WC.
4. ₹ 80,000 WC (Initial outflow) is released in the year 5.

Illustration 4.17

A particular project has a four years life with yearly projected net profit of ₹ 10,000 after charging yearly depreciation of ₹ 8000 in order to write off the capital cost of ₹ 32,000. Out of the capital cost, ₹ 20,000 is payable immediately (year 0) and balance in next year (which will be needed for evaluation). Stock amounting to ₹ 6,000 (to be invested in year 0) will be required throughout the project and for debtors a further sum of ₹ 8,000 will have to be invested in year 1. The working capital will be recouped in year 5. It is expected that the machinery will fetch a residual value of ₹ 2,000 at the end of 4th year. Income tax is payable @ 40% and the Depreciation is charged on written down value @ 25% per annum.

Income tax is payable next year. The residual value of the machine, ₹ 2,000 will also bear tax @ 40%. Although the profit is for 4 years, for computation of tax and realization of working capital, the computation will be required up to 5 years. Advise the firm. [*B.Com.(H), D.U., 2014*]

Solution:

Initial Outflows :

Capital cost at T_0	₹ 20,000
Capital cost at T_1 (₹ 12,000×.909)	10,908
Working Capital (Stock) at T_0	6,000
Working Capital (Debtors) at T_1 (₹8,000×0.909)	7,272
	44,180

Subsequent Annual Inflows :

	Year 1	Year 2	Year 3	Year 4	Year 5
Net Profit (₹)	10,000	10,000	10,000	10,000	–
+Depreciation(₹)	8,000	8,000	8,000	8,000	–
+Residual Value	–	–	–	2,000	–
–Tax @ 40% (of preceding year profit)		4,000	4,000	4,000	–4,800
+Working Capital Recovered	–	–	–	–	14,000
Cash inflow	18,000	14,000	14,000	16,000	9,200
PVF(10, n)	0.909	.826	.751	.683	.621
Present Value	16,362	11,564	10,514	10,928	5,713
Total Present Value					₹ 55,081
Less: Initial Outflows					44,180
Net Present Value					10,901

As the NPV of the project is positive, the firm can take it up.

Illustration 4.18

ABC & Co. is considering a proposal to replace one of its plants coasting ₹ 60,000 and having a written down value of ₹24,000. The remaining economic life of the plant is 4 years after which it will have no salvage value. However, if sold today, it has a salvage of ₹ 20,000. The new machine costing ₹ 1,30,000 is also expected to have a life of 4 years with a scrap value of ₹ 18,000. The machine, due to its technological superiority, is expected to contribute additional annual benefit (before depreciation and tax) of ₹ 60,000. Find out the cash flows associated with this decision given that the rate applicable to the firm is 40%. (The capital gain or loss may be taken as not subject to tax).

[*B.Com.(H), D.U., 2014*]

Solution:

Initial Outflows:

Cost	₹1,30,000	
–Salvage Value of Existing Machine	20,000	
Net Outflows	1,10,000	
Subsequent Annual Inflows:		
Annual Benefits		₹60,000
–Incremental Depreciation (₹28000–₹6000)		22,000
Incremental Profit before Tax		38,000
–Tax @ 40%		15,200
Incremental Profit After Tax		22,800
+Depreciation		22,000
Incremental Cash Inflows		44,800
Terminal Inflows:		
Salvage Value		₹18,000

Illustration 4.19

A machine purchased six years back for ₹ 1,50,000 has been depreciated to a book value of ₹ 90,000. It originally had a projected life of 15 years (Salvage nil). There is a proposal to replace this machine. A new machine will cost ₹ 2,50,000 and result in reduction of operating cost by ₹ 30,000 p.a. for next nine years. The existing machine can now be scrapped away for ₹ 50,000. The new machine will also be depreciated over 9 years period as per straight line method with salvage of ₹ 25,000. Find out whether the existing machine be replaced or not given that the tax rate applicable is 30% and cost of capital 10% (profit or loss on sale of assets is to be ignored for tax purposes).

Solution:

Initial Outflows:		
Cost	₹2,50,000	
–Salvage value of Existing Machine	50,000	
Net Outflow	2,00,000	
Subsequent Annual Inflows:		
Decrease in Operating Cost		₹30,000
Increase in Depreciation		15,000
Net increase in Profit before Tax		15,000
–Tax @ 30%		4,500
Net increase in Profit after Tax		10,500
+Depreciation		15,000
Incremental Cash Inflows		25,500
Terminal Inflows:		
Salvage Value		₹25,000
Calculation of Net Present Value:		
PV of Annual Inflows (₹ 25,500×PVAF$_{(10,9)}$) (₹25,500×5.758)		₹ 1,46,829
+PV of Terminal Inflows (₹25,000×PVF$_{(10,9)}$)		10,600
Total Present Value of Inflows		1,57,429
–Initial Outflow		2,00,000
Net Present Value		–42,571

As the NPV of the replacement decision is negative, the firm need not go for replacement of the machine.

Illustration 4.20

P. Ltd. has a machine having an additional life of 5 years which costs ₹ 10,00,000 and has a book value of ₹ 4,00,000. A new machine costing ₹ 20,00,000 is available. Though its capacity is the same as that of the old machine, it will mean a saving in variable costs to the extent of ₹ 7,00,000 per annum. The life of the machine will be 5 years at the end of which it will have a scrap value of ₹ 2,00,000. The rate of income-tax is 40% and P. Ltd.'s policy is not to make an investment if the yield is less than 12% per annum. The old machine, if sold today, will realise ₹ 1,00,000; it will have no salvage value if sold at the end of 5th year. Advise P. Ltd. whether or not the old machine should be replaced. Capital gain is tax free. Ignore income-tax saving on additional depreciation as well as on loss due to sale of existing machine.

Will it make any difference, if the additional depreciation (on new machine) and gain on sale of old machine is also subject to same tax at the rate of 30%, and the scrap value of the new machine is ₹ 3,00,000. [*B.Com.(H), D.U., 2012*]

Solution :

1. **Cash Outflows :**			
Cost of new-machine	₹ 20,00,000		
–Scrap value of old	1,00,000		₹ 19,00,000
2. **Cash Inflow (Annual):**			
Net savings in variable costs			₹ 7,00,000
–Tax@30%			2,10,000
Net benefit			4,90,000
3. **Cash Inflow at the end of year 5 :**			
Salvage value of new			₹ 2,00,000
4. **Calculation of NPV:**			
Cash outflow at year 0			₹ –19,00,000
Cash inflow : 4,90,000×3.605 (*i.e.*, PVAF$_{(12\%5y)}$)			17,66,450
: 2,00,000×.567 (*i.e.*, PVF$_{(12\%5y)}$)			1,13,400
Net Present Value			– 20,150

As the NPV of the new machine is negative, the firm need not replace the old machine with the new machine.

However, in case, the additional depreciation and capital gain on sale of old machine is also subject to same tax rate @ 30%, then the position would be as follows :

1. **Cash Outflows:**		
Cost of New Machine	₹ 20,00,000	
–Scrap value of Old	1,00,000	
–Tax saving on Capital Loss 30% of (4,00,000-1,00,000)	90,000	₹18,10,000
2. **Cash Inflows (Annual):**		
Net savings in variable costs	₹ 7,00,000	
–Additional depreciation	2,60,000	

Savings before tax	4,40,000
–Tax @ 30%	1,32,000
Net benefit	3,08,000
+ Depreciation added back	2,60,000
Cash inflows (annual)	5,68,000

3. **Cash Inflow at the end of year 5 :**

Salvage value of new	₹ 3,00,000

4. **Calculation of NPV:**

Cash outflow at year 0		₹ –18,10,000
Cash inflow	: 5,68,000×3.605(*i.e.*, $PVAF_{(12\%5y)}$)	20,47,640
	: 3,00,000×.567(*i.e.*, $PVF_{(12\%5y)}$)	1,70,100
Net Present Value		4,07,740

As the NPV of the new machine is ₹ 4,07,740, the firm may replace the old machine. The depreciation (additional) on new machine has been calculated as follows :

Depreciation on new machine (20,00,000 – 3,00,000)/5	3,40,000
Depreciation on old machine (4,00,000/5)	80,000
Additional depreciation	2,60,000

It may be noted that the proposal is not acceptable in one set of assumptions, however, when the assumption regarding taxability of depreciation and capital gains/loss is changed, the proposal becomes acceptable.

Illustration 4.21

A company has to make a choice between two projects namely A and B. The initial capital outlay of two Projects are ₹ 1,35,000 and ₹ 2,40,000 respectively for A and B. There will be no scrap value at the end of the life of both the projects. The opportunity Cost of Capital of the company is 16%. The annual incomes are as under :

Year	Project A	Project B
1	—	₹ 60,000
2	₹ 30,000	84,000
3	1,32,000	96,000
4	84,000	1,02,000
5	84,000	90,000

You are required to calculate for each project :

(*i*) Net Present Value,

(*ii*) Discounted Payback period,

(*iii*) Profitability Index.

Solution :

Computation of Net Present Values of Projects :

Year	Cashflows		Discounted cash flows		
	Project A	Project B	$PVF_{(16\%,n)}$	Project A	Project B
1	—	60,000	0.862	—	51,720
2	30,000	84,000	0.743	22,290	62,412
3	1,32,000	96,000	0.641	84,612	61,536
4	84,000	1,02,000	0.552	46,368	56,304
5	84,000	90,000	0.476	39.984	42,840
Total Net present value				1,93,254	2,74,812
Less: Initial Cost				1,35,000	2,40,000
Net Present Value				58,254	34,812

Calculation of Discounted Payback Period :

Cumulative Present values of Projects cash inflows

Year	Project A		Project B	
	PV of inflows	Cumulative PV	PV of inflows	Cumulative PV
1	—	—	₹ 51,720	51,720
2	₹ 22,290	₹ 22,290	62,412	1,14,132
3	84,612	1,06,902	61,536	1,75,668
4	46,368	1,53,270	56,304	2,31,972
5	39,984	1,93,254	42,840	2,74,812

Cumulative PV of cash inflows of Project A after 3 years = ₹ 1,06,902
Cumulative PV of cash inflows of Project B after 4 years = ₹ 2,31,972

A comparison of projects cost with their cumulative PV clearly shows that the Project A's cost will be recovered in less than 4 years and that of Project B in less than 5 years. The exact Discounted payback period can be computed as follows :

	Project A	Project B
Recovery in 3/4 years	₹ 1,06,902	₹ 2,31,972
Recovery yet to be made	28,098	8,028
PV of next year	46,368	42,840
Period required for unrecovered amount	(28,098/46,368)	(8,028/42,840)
	= .61 year	.19 year
So, Discounted payback period	= 3.61 years	4.19 years

Calculation of Profitability Index :

$$\text{Profitability Index} : \frac{\text{PV of cash inflows}}{\text{Initial cash outlay}}$$

$$\text{Profitability Index (}\textit{for Project A}\text{)} : \frac{₹\ 1,93,254}{₹\ 1,35,000} = 1.43$$

$$\text{Profitability Index (}\textit{for Project B}\text{)} : \frac{₹\ 2,74,812}{₹\ 2,40,000} = 1.15$$

Illustration 4.22

Modern Enterprises Ltd. is considering the purchase of a new computer system for its Research and Development Division, which would cost ₹ 35 lacs. The operation and maintenance costs (excluding depreciation) are expected to be ₹ 7 lacs per annum. It is estimated that the useful life of the system would be 6 years, at the end of which the disposal value is expected to be ₹ 1 lac.

The tangible benefits expected from the system in the form of reduction in design and draftsmanship costs would be ₹ 12 lacs per annum. Besides, the disposal of used drawing office equipment and furniture, initially, is anticipated to net ₹ 9 lacs.

Capital expenditure in research and development would attract 100% write-off for tax purposes. The gains arising from disposal of used assets may be considered tax-free. The company's effective tax rate is 30%. The average cost of capital to the company is 12%. After appropriate analysis of cash flows, please advise the company of the financial viability of the proposal.

Solution :

1. **Cash outflow :**

Cost of new Computer	₹ 35 lacs
–Disposal of Office	₹ 9 lacs
Total	₹ 26 lacs

2. **Cash inflows (Annual)**	₹ in lacs
Saving in Design and Draftsmanship cost	12.00
–Operation and Maintenance cost	7.00
	5.00
After 30% Tax	3.50
3. **30% Tax saving** on ₹ 35 lacs available at the end of Year 1	10.50
4. **Sales value** of Computer after 6 years	1.00

The total cash inflows for the year 1 would be ₹ 13.50 lacs (*i.e.,* ₹ 10.50 lacs+₹ 3.50 lacs). Similarly, the total inflow for the last year would be ₹ 4.50 (*i.e.,* ₹ 3.50 lacs+₹ 1 lac).

Calculation of Net Present Value **(₹ in lacs)**

Year	Cash flows (₹)	$PVF_{(12\%,n)}$	PV (₹)
0	–26.00	1.000	–26.00
1	13.50	0.893	12.06
2	3.50	0.797	2.79
3	3.50	0.712	2.49
4	3.50	0.636	2.23
5	3.50	0.567	1.98
6	4.50	0.507	2.28
			–2.17

As the NPV is positive ₹ –2,17,000, the proposal may not be accepted.

Illustration 4.23

A Machine purchased six years back for ₹ 1,50,000 has been depreciated to a book value of ₹ 90,000. It originally had a projected life of 15 years (salvage *nil*). There is a proposal to replace this machine. A new machine will cost ₹ 2,50,000 and result in reduction of operating cost by ₹ 30,000 p.a. for next nine years. The existing machine can now be scrapped away for ₹ 50,000. The new machine will also be depreciated over 9 year period as per straight line method with salvage of ₹ 25,000. Find out whether the existing machine be replaced given that the tax rate applicable is 30% and cost of capital 10% (profit or loss on sale of assets is to be ignored for tax purposes).

Solution :

The incremental cash flows of the replacement decision may be ascertained as follows:

(i) Initial cashflow :	
Cost of New machine	₹ 2,50,000
Less Scrap value of old	50,000
Net outflow	2,00,000
(ii) Subsequent cash inflows (Annual) :	
Savings in Operating cost (A)	₹ 30,000
Depreciation on New Machine (2,50,000 – 25,000) ÷ 9	25,000
Depreciation on Old machine (90,000 ÷ 9)	10,000
Incremental Depreciation (B)	15,000
Increase in Profit (A–B)	15,000
–Tax @ 30%	4,500
Profit After Tax	10,500
Depreciation added back	15,000
Cash Inflow	25,500
(iii) Terminal cash inflow :	
Scrap Value of New	₹ 25,000

Calculation of Net Present Value

Year	Cashflows	PV Factor	PV (₹)
0	₹2,00,000	1.000	₹–2,00,000
1-9	₹ 25,500	$PVAF_{(10\%,9)} = 5.759$	1,46,755
9	₹ 25,000	$PVF_{(10\%,9)} = .424$	10,600
			–42,545

The proposal has a negative NPV, hence machinery need not be replaced.

Illustration 4.24

Central Gas Ltd. is considering to enhance its production capacity. The following two mutually exclusive proposals are being considered :

	Proposal I	Proposal II
Plant	₹2,00,000	₹3,00,000
Building	50,000	1,00,000
Installation	10,000	15,000
Working capital required	50,000	65,000
Annual Earnings (before depreciation)	70,000	95,000
Sales Promotion expenses	—	15,000
Scrap Value of Plant	10,000	15,000
Disposable Value of Building	30,000	60,000

Life of the Project is 10 years. Sales promotion expenses of Proposal II are required to be incured at the end of 2nd year? These expenses have not been considered to find out the Annual earnings (given above). Which proposal be accepted given that the cost of capital of the firm is 8%. Ignore taxation.

Solution :

In this case, the Annual earnings before depreciation are given for the proposals. As the tax is to be ignored, these earning may be considered as cash flows also. (It may be noted that there is no tax benefit of depreciation in this case). The two proposals may be evaluated as follows :

	Proposal I	Proposal II
Initial Cash Outflow :		
Cost of Plant	₹ 2,00,000	₹ 3,00,000
Installation Expenses	10,000	15,000
Cost of Building	50,000	1,00,000
Working Capital required	50,000	65,000
Total outflow	3,10,000	4,80,000
Present Value of Annual Inflows :		
Profit before Depreciation	₹ 70,000	₹ 95,000
$PVAF_{(8\%, 10)}$	6.710	6.710
Present Value	₹ 4,69,700	₹ 6,37,450
–Present Value of Sales Promotion Exp. ($15000 \times PVF_{(8\%,2)}$)	—	(12,855)
Present Value of Inflows (Annual)	4,69,700	6,24,595
Present Value of Terminal Inflows :		
Release of Working capital	₹ 50,000	₹ 65,000
Sale value of Plant.	10,000	15,000
Disposable value of Building	30,000	60,000
	90,000	1,40,000
$PVF_{(8\%, 10)}$	.463	.463
Present Value of Terminal inflows	₹ 41,670	₹ 64,820
Calculation of Net Present Value :		
PV of Annual Inflows	₹ 4,69,700	₹ 6,24,395
+ PV of Terminal Inflows	41,670	64,820
Total	5,11,370	68,9415
– PV of outflows	3,10,000	4,80,000
Net Present Value	2,01,370	2,09,415

Proposal II has higher NPV and so, it may be accepted by the firm.

Illustration 4.25

ABC Ltd. is in the business of manufacturing coir mattresses. It has a plant on a piece of land measuring two acres which was purchased ten years ago for ₹ 10 lacs. The firm is now planning to set up another plant on the same land. 50% of the existing plot is to be earmarked for this purpose. The accountant has supplied the following information :

Capital Expenditure for setting up new plant (incurred in the beginning of the year) :

Year 1	Cost of land	₹ 5,00,000
	Land Development	17,00,000
	Payment for purchase of Machine	20,00,000
Year 2	Final payment for Land Development	15,00,000
	Final payment to Machine supplier	70,00,000

The Plant has an estimated useful life of 5 years and the company follows SL method of depreciation. The information regarding sales and operational expenses is as follows :

Year	1	2	3	4	5
Sales (₹ lacs)	25	30	35	40	45
Expenses (₹ lacs)	5	7	10	12	15

During first year and last year, all sales will be cash sales. In others, 10% of sales will be on credit for a period of one year. If the company's rate of discount is 15% and the tax rate is 30%, should the above proposal be accepted, given that payment for Land Development does not qualify for tax rebate.

Solution :

Calculation of Present Value of Outflows

Outflows in the beginning of Year 1 :	**Amt. (₹)**	**Amt.(₹)**
Land Development	17,00,000	
Payment for Machinery	20,00,000	
	37,00,000	37,00,000
Outflows in the beginning of Year 2 :		
Final Payment for Land Development		15,00,000
Final Payment for Machine		70,00,000
		85,00,000
Present Value of this outflow in the beginning of Year 1		
$= ₹ 85,00,000 \times PVF_{(15\%,1)}$		
$= ₹ 85,00,000 \times .870$		73,95,000
Total PV of outflows		1,10,95,000

Calculation of Present Value of Inflows :

	Years				
	1	**2**	**3**	**4**	**5**
Sales	₹ 25,00,000	₹ 30,00,000	₹ 35,00,000	₹ 40,00,000	₹ 45,00,000
– Expenses	5,00,000	7,00,000	10,00,000	12,00,000	15,00,000
– Depreciation	18,00,000	18,00,000	18,00,000	18,00,000	18,00,000
Profit before Tax	2,00,000	5,00,000	7,00,000	10,00,000	12,00,000
–Tax @ 30%	60,000	1,50,000	2,10,000	3,00,000	3,60,000
Profit After Tax	1,40,000	3,50,000	4,90,000	7,00,000	8,40,000
+ Depreciation	18,00,000	18,00,000	18,00,000	18,00,000	18,00,000
Change in Working Cap.	—	–3,00,000	–50,000	–50,000	+ 4,00,000
Cash flow	19,40,000	18,50,000	22,40,000	24,50,000	30,40,000
$PVF_{(15\%,n)}$	.870	.756	.658	.572	.497
Present Value (₹)	16,87,800	13,98,600	14,73,920	14,01,400	15,10,880
Total PV of Inflows					₹ 74,72,600
Total PV of Outflows (Calculated above)					1,10,95,000
Net Present Value					–36,22,400

As the NPV of the project is negative, it need not be adopted.

Illustration 4.26

The Income Statement of X Ltd. for the current year is as follows :

Sales		₹ 7,00,000
Less Costs: Material	₹ 2,00,000	
Labour	2,50,000	
Other Operating Cost	80,000	
Depreciation	70,000	6,00,000
EBIT		1,00,000
Less : Taxes @ 30%		30,000
Profit after Tax		70,000

The Plant Manager proposes to replace an existing machine by another machine costing ₹ 2,40,000. The new machine will have 8 years life having no salvage value. It is estimated that new machine will reduce the labour costs by ₹ 50,000 per year. The old machine will realise ₹ 40,000. Income statement does not include the depreciation on old machine (the one that is going to be replaced) as the same had been fully depreciated for tax purposes last year though it will still continue to function, if not replaced, for a few years more. It is believed that there will be no change in other expenses and revenue of the firm due to his replacement. The company requires an After-Tax Return of 10%. The rate of tax applicable to company's income is 30%. Should the company buy the new machine, assuming that the company follows straight line

method of depreciation and the same is allowed for tax purposes?

Solution :

Initial Outlay		
Cost of New Machine		₹ 2,40,000
– Salvage of existing machine		40,000
		2,00,000
Profit on Sale of existing :		
Book Value	*Nil*	
Salvage Value	₹ 40,000	
Profit on Sale	₹ 40,000	
Tax @ 30% on ₹ 40,000		12,000
Net Outflow		2,12,000
Annual Incremental Cash Inflows		
Savings in Labour Expenses		₹ 50,000
Depreciation on New Machine		30,000
Net Increase in Profit		20,000
–Tax @ 30%		6,000
Profit After Tax		14,000
+ Depreciation		30,000
Incremental Cash Inflow		44,000
Calculation of Net Present Value		
PV of Incremental Inflows (44,000 × 5.335)		₹ 2,34,740
– PV of Outflows (calculated above)		2,12,000
NPV		22,740

As the NPV of the proposal is positive, the company may replace the machine.

Illustration 4.27

Strong Enterprises Ltd. is a manufacturer of high quality running shoes. Mr. Dazlling, President, is considering the company's ordering, inventory and billing procedures. He estimates that the annual savings from computerization include a reduction of ten clerical employees with annual salaries of ₹ 15,000 each, ₹ 8,000 from reduced production delays caused by raw materials inventory problems, ₹ 12,000 from lost sales due to inventory stockouts and ₹ 3,000 associated with timely billing procedures. The purchase price of the system is ₹ 2,00,000 and installation costs are ₹ 50,000. These outlays will be capitalised (depreciated) on a straight-line basis to a zero book salvage value which is also its market value at the end of five years. Operation of the new system requires two computer specialists with annual salaries of ₹ 40,000 per person. Also annual maintenance and operating (cash) expenses of ₹ 12,000 are estimated to be required. The company's tax rate is 30% and its required rate of return (cost of capital) for this project is 12%. You are required to :

(*a*) Find the project's different cash flows.

(*b*) Evaluate the project using NPV method, PI method, and payback period method.

(*c*) Find the project's cash flows and NPV assuming that the system can be sold for ₹ 25,000 at the end of five years even though the book salvage value will be zero and that capital gain is subject to tax.

(*d*) Find the project's cash flows and NPV assuming that the book salvage value for depreciation purposes is ₹ 20,000 even though the machine is worthless is terms of its resale value, and that such loss of ₹ 20,000 (book value) is allowed for tax purposes.

Solution :

(*a*) **Project's Initial cash outlay :**

Cost	₹ 2,00,000
Installation Expenses	50,000
Total net Cash Outlay	2,50,000

Depreciation per year = ₹ 2,50,000/5 = ₹ 50,000

(*b*) **Project's Operating cash flows over its 5-year life :**

Savings		₹ 1,50,000
Reduction in clerks salaries		8,000
Reduction in production delays		12,000
Reduction in lost sales		3,000
Gains due to timely billing		1,73,000
–Depreciation	₹ 50,000	
–Additional Specialists cost	80,000	
–Maintenance cost	12,000	1,42,000
Profit before Tax		31,000
Less Tax @ 30%		9,300
Profit after Tax		21,700

Cash flow = PAT + Depreciation
= ₹ 21,700 + ₹ 50,000 = ₹ 71,700

(*c*) **Evaluation of the Project by using NPV Method :**

Year	Cash flow	$PVAF_{(12\%, 5y)}$	Total PV
1—5	₹ 71,700	3.605	₹ 2,58,479
Less : Total initial Cash Outlay			–2,50,000
		NPV =	₹ 8,479

Since NPV is positive, the project is viable.

(*d*) **Evaluation of the Project by using PI Method :**

Profitability Index (PI) = (PV of cash inflows)/PV of cash outflows
= 2,58,479/2,50,000 = 1.034

Since PI is more than 1.0, the project is viable.

(*e*) **Calculation of the Project's Payback Period :**

$$PI = \frac{₹\ 2,50,000}{₹\ 71,700} = 3.49 \text{ years}$$

Therefore, the payback period is 3.49 years.

(*f*) **Calculation of cash flows and NPV assuming when the system can be sold for ₹ 25,000 at the end of 5-years :** In case the project has a salvage of ₹ 25,000 (book value nil) at the end of five years, the whole of ₹ 25,000 is capital gain and subject to tax at the rate of 30%. The present value of the after tax salvage amount is to be added to the current NPV.

Post tax salvage value in year 5 = ₹ 17,500 (*i.e.*, ₹ 25,000 × .70)

Present value of ₹ 17,500 discounted at 12% is (₹ 17,500 × 0.567) = ₹ 9,923. New NPV is ₹ 9,923 + ₹ 8,479 = ₹ 18,402. Since NPV > 0, the project is viable.

(*g*) **Project's cash flows and NPV assuming that the book salvage value for depreciation purposes is ₹ 20,000 :**

Depreciation = (₹ 2,50,000 – ₹ 20,000)/5 = ₹ 46,000 per year

Cash inflow for the years 1 to 5 are

Savings (Calculated as earlier)	₹ 1,73,000
–Depreciation	46,000
–Additional Specialists cost	80,000
–Maintenance cost	12,000
Profit before tax	35,000
Tax @ 30%	10,500
Profit after tax	24,500
Cash inflow (24,500 + 46,000)	70,500

Calculation of NPV : It may be noted that at the end of year 5, the book value of the project would be ₹ 20,000 but it is realizable nil. So, the capital loss of ₹ 20,000 will result in tax savings of ₹ 6,000 (*i.e.*, ₹ 20,000 × 30%), as the capital loss is available for tax purposes in view of the information given. So, at the end of year 5, there would be an additional inflow of ₹ 6,000. The NPV may now be calculated as follows :

Years	Cash flows	$PVF_{(12\%, n)}$	PV
1—5	₹ 70,500	3.605	₹ 2,54,152
5	6,000	.567	3,402
PV of inflows			2,57,554
Outflows			2,50,000
NPV			7,554

As the NPV of the project is positive, the project is viable.

Illustration 4.28

A company has to make a choice between two identical machines, A and B, which have been designed differently but do exactly the same job.

Machine A costs ₹ 7,50,000 and will last for 3 years. It will cost ₹ 2,00,000 per year to run. Machine B is an economy model costing only ₹ 5,00,000. But will last only 2 years. Its running charges are ₹ 3,00,000 per year.

Ignore taxes. If the opportunity cost of capital is 9%, which machine the company should buy?

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Solution:

As the lives of two machines are different, the decision can be taken up on the basis of Equivalent Annuity Value of outflows as follows:

Cost	Machine A	Machine B
	= ₹ 5,06,200	= ₹ 5,27,700
PV of Total Cost	₹ 12,56,200	₹ 10,27,700
$PVAF_{(9, n)}$	2.531	1.759
Equivalent Annuity Value	₹ 4,96,326	₹ 5,84,252

As the EAV of cost of Machine A is lower, the firm should prefer it.

Illustration 4.29

Following are the data on a capital project being evaluated by the management of X Ltd.

Particulars	Project M
Annual cost saving	₹ 40,000
Useful life	4 years
Internal Rate of Return	15%
Profitability Index	1.064
Net Present Value	?
Cost of Capital	?
Cost of Project	?
Payback Period	?
Salvage value	0

Find the missing values.

Solution:

In this case, the annual cost saving is ₹ 40,000 and the IRR is 15%. It means that the present value of inflows (in terms of cost saving) is equal to the present value of outflow as 15%, and the NPV is 0. It means that the outflow is ₹ 40,000 x 2.855 = ₹ 1,14,200.

As the PI is given at 1.064, the total inflows may be taken as ₹ 1,14,200 x PI Factor *i.e.*, ₹ 1,14,200 x 1.064 = ₹ 1,21,509. So, the project is having outflows of ₹ 1,14,200 and the inflows of ₹ 1,21,509. The NPV of the project may be taken as the difference of the two :

NPV = PV of Inflows – Outflows
= ₹ 1,21,509 – 1,14,200
= ₹ 7,309

The outflows or the cost of the project is ₹ 1,14,200 and the annual inflows is ₹ 40,000. Therefore, the payback period is ₹ 1,14200÷40,000=2.855.

Now, in order to find out the cost of capital, it may be observed that the present value of inflows is ₹ 1,21,509 which is the discounted value of the annuity of ₹ 40,000 for 4 years. The PV factor, therefore, is 1,21,509 ÷ 40,000 = 3.038. The PVF 3.038 can be found in the 12% column of the discount factor table. So, the cost of capital of the firm is 12%.

Illustration 4.30

ABC Ltd. is evaluating the following two mutually exclusive proposals.

	Project X	Project Y
Outlay	₹ 40,000	₹ 60,000
Annual net inflow	₹ 15,000	₹ 16,000
Life	4 years	7 years
Scrap value	₹ 5,000	₹ 3,000

Evaluate the proposals if the discount rate is 15%.

Solution:

Calculation of NPV for Project X

Year	Cash flows	$PVF_{15\%,n)}$	PV(₹)
0	-40,000	1.000	-40,000
1-4	15,000	2.855	42,825
4	5,000	.572	2,860
		Total	5,685

Calculation of NPV for Project Y

Year	Cash flows	$PVF_{(15\%,n)}$	PV (₹)
0	-60,000	1.000	-60,000
1-7	16,000	4.160	66,560
7	3,000	.376	1.128
		Total	7,688

In this case, the Project X is giving NPV of ₹ 5,685 after every 4 years and the Project Y is giving NPV of ₹ 7,688 after every 7 years. They can be made comparable by finding out the value of equivalent annuity as follows :

Equivalent Annuity Amount = $NPV/PVAF_{(r.n)}$
Equivalent Annuity Amount (X) = ₹ 5,685/2.855
= ₹ 2,000
Equivalent Annuity Amount (Y) = ₹ 7,688/4.160
= ₹ 1,848

Therefore, the firm should select project X as it is having higher equivalent annuity.

Illustration 4.31

ABC and Co. is considering two mutually exclusive machines X and Y. The company uses a Certainty Equivalent approach to evaluate the proposals. The estimated cash flow and certainty equivalents for both machines are as follows :

	Machine X		Machine Y	
Year	Cash flow	Cer. Eqult.	Cash flow	Cer. Eqult.
0	₹ –30,000	1.00	₹ –40,000	1.00
1	15,000	.95	25,000	.90
2	15,000	.85	20,000	.80
3	10,000	.70	15,000	.70
4	10,000	.65	10,000	.60

Which machine should be accepted, if the risk-free discount rate is 5 per cent.

Solution:

In this case, the given cash flows are to be multiplied by the certainty equivalent (CE) to convert the cash flows into Certain cash flows. Thereafter, the NPV of both the projects may be calculated by discounting the Certain cash flows @ 5% *i.e.*, the risk free discount rate as follows :

Machine X :

$$NPV = 1.0(-30,000) + \frac{.95(15,000)}{(1.05)} + \frac{.85(15,000)}{(1.05)^2} + \frac{.70(10,000)}{(1.05)^3} + \frac{.65(10,000)}{(1.05)^4} = ₹\ 6.258.$$

Machine Y :

$$NPV = 1.0(-40,000) + \frac{.90(25,000)}{(1.05)} + \frac{.80(20,000)}{(1.05)^2} + \frac{.70(15,000)}{(1.05)^3} + \frac{.60(10,000)}{(1.05)^4} = ₹\ 9,942.$$

Machine Y should be preferred since it has higher NPV.

Illustration 4.32

Determine the Risk Adjusted Net Present Value of the following projects :

	A	B	C
Net cash outlays (₹)	1,00,000	1,20,000	2,10,000
Project life	5 years	5 years	5 years
Annual cash inflow (₹)	30,000	42,000	70,000
Coefficient of Variation	0.4	0.8	1.2

The company selects the risk-adjusted rate of discount on the basis of the Coefficient of Variation :

Coefficient of Variation	Risk Adjusted Rate of Discount	Present value factor 1 to 5 years at Risk Adjusted Rate of Discount
0.0	10%	3.791
0.4	12%	3.605
0.8	14%	3.433
1.2	16%	3.274
1.6	18%	3.127
2.0	22%	2.864
More than 2.0	25%	2.689

Solution: **Statement showing the determination of the Risk Adjusted Net Present Value**

Projects	Net Cash outlays	Coefficient of Variation	Risk Adjusted Discount Rate	Annual Cash Inflow	PV factor 1-5 years	Discounted Cash Inflow	Net Present Value
(i)	(ii)	(iii)	(iv)	(v)		(vi)=(iv) × (v)	(vi) - (ii)
A	₹ 1,00,000	0.40	12%	₹ 30,000	3.605	₹ 1,08,150	₹ 8,150
B	1,20,000	0.80	14%	42,000	3.433	1,44,186	24,186
C	2,10,000	1.20	16%	70,000	3.274	2,29,180	19,180

Illustration 4.33

Delta Corporation is considering an investment in one of the two mutually exclusive proposals-

Project - A : It requires initial outlay of ₹ 1,70,000.

Project - B : It requires initial outlay of ₹ 1,50,000.

The Certainty-Equivalent approach is employed in evaluating risky investments. The current yield on treasury bills is 5% and the company uses this as riskless rate. Expected values of net cash inflows with their respective certainty-equivalents are:

Year	Project-A		Project-B	
	Cash Inflows	Certainty Equivalent	Cash Inflows	Certainty Equivalent
1	₹ 90,000	0.8	₹ 90,000	0.9
2	1,00,000	0.7	90,000	0.8
3	1,10,000	0.5	1,00,000	0.6

(*i*) Which project should be acceptable to the company?

(*ii*) Which project is riskier and why ? Explain.

(*iii*) If the company was to use the Risk-Adjusted Discount Rate method, which project would be analysed with higher rate?

Solution

Determination of NPV of Project A:

Year	Cash inflows	Certainty Equivalent	Adjusted Cash inflows	$PVF_{(5,n)}$	Total PV
1	₹ 90,000	0.8	₹ 72,000	0.952	₹ 68,544
2	1,00,000	0.7	70,000	0.907	63,490
3	1,10,000	0.5	55,000	0.864	47,520
					1,79,554

NPV = ₹ 1,79,554 – 1,70,000 = ₹ 9,554

Determination of NPV of Project B:

Year	Cash inflows	Certainty Equivalent	Adjusted Cash inflows	$PVF_{(5,n)}$	Total PV
1	₹ 90,000	0.9	₹ 81,000	0.952	₹ 77,112
2	90,000	0.8	72,000	0.907	65,304
3	1,00,000	0.6	60,000	0.864	51,840
					1,94,256

NPV = ₹ 1,94,256 – 1,50,000 = ₹ 44,256

(*i*) Project B should be acceptable as its NPV is greater.

(*ii*) Project A is riskier because its certainty equivalent are lower.

(*iii*) Project A being more risky, it would be analysed with higher discount rate.

CAPITAL BUDGETING PROBLEMS BASED ON BLOCK OF ASSETS CONCEPT

Illustration 4.34

Alpha Engineering company is generating 1,00,000 units of waste material per annum. The waste material can be processed further and sold @ ₹ 1000 per unit and the variable cost of processing comes to 70% of selling price.

Out of the processed waste material, 25% can be refabricated at a cost of ₹ 100 per unit and the refabricated product can be sold at a price of ₹ 1,500 per unit and there is a waste of 20% of processed material at the time of refabrication.

The refabrication procedure requires (*i*) a capital expenditure of ₹ 100,00,000 with life 5 years. (Depreciation is chargeable @ 25% WDV) and (*ii*) additional working capital of ₹ 10,00,000. Evaluate the proposal to refabricate the processed waste material given that :

(*i*) Required rate of return is 15%.

(*ii*) Tax rate applicable to company is 35%.

(*iii*) Expected salvage value of the plant is ₹ 10,00,000.

(*iv*) There is no other asset in the same block of assets.

Solution :

Out the total waste material *i.e.*, 1,00,000 units, only 25% *i.e.* 25,000 units can be processed and refabricated. The capital budgeting proposal of refabrication can be evaluated as follows :

Initial Cash Outflows :

Capital Expenditure	₹ 100,00,000
Additional Working Capital	10,00,000
Total	110,00,000

Subsequent Inflows (Annual) : **(Figures in ₹)**

	Year 1	Year 2	Year 3	Year 4	Year 5
Refabricated units (25,000 – 20%)	20,000	20,000	20,000	20,000	20,000
Sales after refabrication @ ₹ 1500	300,00,000	300,00,000	300,00,000	300,00,000	300,00,000
Sales before refabrication (25000 × 1000)	250,00,000	250,00,000	250,00,000	250,00,000	250,00,000
Incremental sales	50,00,000	50,00,000	50,00,000	50,00,000	50,00,000
Less Refabrication Cost (25000 × 100)	25,00,000	25,00,000	25,00,000	25,00,000	25,00,000
Less Dep. @ 25% W.D.V.	25,00,000	18,75,000	14,06,250	10,54,688	—
Incremental Profit before tax	—	6,25,000	10,93,750	14,45,312	25,00,000
Less Tax @ 35%	—	2,18,750	3,83,813	505,859	8,75,000
Incremental Profit after tax	—	4,06,250	7,10,937	9,39,453	16,25,000
Depreciation (added back)	25,00,000	18,75,000	14,06,250	10,54,688	—
Incremental cash inflow	25,00,000	22,81,250	21,17,187	19,94,141	16,25,000
Terminal Cash Inflow :					
Salvage Value					10,00,000

	Year 1	Year 2	Year 3	Year 4	Year 5
Tax-shield on short-term capital loss :					
WDV of Asset	31,64,062				
–Salvage Value	10,00,000				
	21,64,062				
Tax saving @ 35%	7,57,422	7,57,422			
Release of working capital		10,00,000			
		27,57,422			

Calculation of NPV :

Year	Cashflow	$PVF_{(15\%,n)}$	PV (₹)
0	₹ –110,00,000	1.000	–110,00,000
1	25,00,000	.870	2175,000
2	22,81,250	.756	17,24,625
3	21,17,187	.658	13,93,109
4	19,94,141	.572	11,40,649
5	16,25,000	.497	8,07,625
5	27,57,422	.497	13,70,444
			–23,88,548

As the NPV of the proposal to refabricate the processed waste material is negative, the firm need not take up the proposal.

(*Note :* As the problem states that there is no other asset in the same block of asset, there is no depreciation provided for the terminal year. The salvage value and the WDV of the asset at the end of year 5 have been compared to find out the short-term capital loss which gives tax saving @ 35%.

Illustration 4.35

Finman Construction Company is interested in the computerization of its office work. For this purpose two models have been shortlisted, for which the relevant information is as follows :

	Model I	Model II
Cost	₹ 1,50,000	₹ 2,50,000
Salvage Value	*Nil*	*Nil*
Working Capital Required	₹ 50,000	₹ 70,000
Savings in Expenses	₹ 1,00,000 p.a.	₹ 1,50,000 p.a.
Life	5 years	5 years
Depreciation	25% W.D.V.	25% W.D.V.

Find out which model is better given that :

(*i*) Tax rate is 35%.

(*ii*) Required rate of return is 13%.

(*iii*) There is no other asset in the same block of assets.

Solution :

Initial Cash outflow :

	Model I	Model II
Cost of the Machine	₹ 1,50,000	₹ 2,50,000
Working Capital required	50,000	70,000
Total	2,00,000	320,000

Subsequent Inflows (Annual) : **(Figures in ₹)**

Model I	Year 1	Year 2	Year 3	Year 4	Year 5
Savings in Expenses	1,00,000	1,00,000	1,00,000	1,00,000	1,00,000
–Depreciation @ 25% WDV	37,500	28,125	21,094	15,820	—
Incremental earnings	62,500	71,875	78,906	84,180	1,00,000
–Tax @ 35%	21,875	25,156	27,617	29,463	35,000
Profit After Tax	40,625	46,719	51,289	54,717	65,000
Depreciation added back	37,500	28,125	21,094	15,820	—
Cash flow	78,125	74,844	72,383	70,537	65,000
$PVF_{(13\%,n)}$	.885	.783	.693	.613	.543
PV(₹)	69,140	58,603	50,161	43,239	35,295
Total Present Value					₹ 2,56,438
Model II					
Savings in Expenses	150,000	150,000	1,50,000	1,50,000	150,000
– Depreciation	62,500	46,875	35,156	26,367	—
Incremental Earnings	87,500	103,125	1,14,844	1,23,633	1,50,000
–Tax @ 35%	30,652	36,094	40,196	43,272	52,500
Profit After Tax	56,875	67,031	74,648	80,361	97,500
Depreciation added back	62,500	46,875	35,156	26,367	—
Cash flow	1,19,375	1,13,906	1,09,804	1,06,728	97,500
$PVF_{(13\%,n)}$	.885	.783	.693	.613	.543
PV(₹)	1,05,647	89,188	76,094	65,424	52,943
Total Present Value					3,89,296

Terminal Cash Inflows : **(Figures in ₹)**

	Model I	Model II
Release of working capital (A)	50,000	70,000
Short term Capital loss :		
W.D.V. of Asset	47,461	79,102
Salvage	*Nil*	*Nil*
Loss	47,461	79,102
Tax saving @ 35% (B)	16,611	27,686
Net cash Inflow (A+B)	66,611	97,686

Calculation of NPV : **(Figures in ₹)**

	Model I	Model II
PV of Inflows (Annual)	2,56,438	3,89,296
PV of Terminal Inflow @ 13%		
(66,611 × 543)	36,170	—
(97,686 × 543)	—	53,044
	2,92,608	4,42,340
Less Initial outflow	2,00,000	3,20,000
Net Present Value	92,608	1,22,340

Though, both the proposals have positive NPV and hence acceptable. However, Model II should be preferred because it has higher NPV.

[*Note :* As there is no other in the same block of assets, there will not be any depreciation in the last year. However, the loss at the time of disposing off the asset is tax deductible at normal tax rate of 35%.]

OBJECTIVE TYPE QUESTIONS

State whether each of the following statements is ***True (T)*** *or* ***False (F)****.*

(*i*) Capital budgeting evaluation technique should be capable of ranking different proposals.

(*ii*) Payback technique incorporates all cashflows of a proposal.

(*iii*) Payback technique is based on discounting technique.

(*iv*) Accounting Rate of Return may be considered as the best technique of evaluation of capital budgeting proposals.

(*v*) Payback technique is more an indication of liquidity than of profitability.

(*vi*) Accounting Rate of Return does not ignore time value of money.

(*vii*) Time value of money is the hall mark of all discounted cashflow techniques.

(*viii*) In NPV techniques, only the future inflows are discounted.

(*ix*) A positive NPV means that the proposal must be undertaken.

(*x*) NPV represents net addition to wealth of shareholders.

(*xi*) Profitability Index ignores the salvage value of the project.

(*xii*) PI gives the expected return from the proposal in % form.

(*xiii*) NPV and PI are more or less the same technique.

(*xiv*) Same information is required for the calculation of NPV and IRR.

(*xv*) IRR technique cannot be applied if the inflows are not in annuity form.

(*xvi*) IRR technique is based on all relevant cash flows.

(*xvii*) IRR and NPV always give same decision.

(*xviii*) In case of different ranking, the IRR ranking should be preferred.

(*xix*) The reinvestment rate in NPV and IRR is always same.

(*xx*) IRR technique always gives clear-cut decision rule.

[**Answers :** *(i) T, (ii) F, (iii) F, (iv) F, (v) T, (vi) F, (vii) T, (viii) F, (ix) F, (x) T, (xi) F, (xii) F, (xiii) T, (xiv) F, (xv) F, (xvi) T, (xvii) F, (xviii) F, (xix) F, (xx) F.*]

MULTIPLE CHOICE QUESTIONS

1. Which of the following statements is correct?
   (*a*) If PI < I, its NPV is less than zero,
   (*b*) If PI = 0, its NPV is greater than zero,
   (*c*) If P > 1, its NPV will be negative,
   (*d*) PI of a project is always greater than one.

2. Profitability Index method is an extension of :
   (*a*) Net Present Value,
   (*b*) Internal Rate of Return,
   (*c*) Payback Period,
   (*d*) Accounting Rate of Return.

3. Which of the following variables is not known in Internal Rate of Return?
   (*a*) Initial Cash Flows,
   (*b*) Discount Rate,
   (*c*) Terminal Inflows,
   (*d*) Life of the Project.

4. In case of Mutually Exclusive Proposals :
   (*a*) Only the best project is selected,
   (*b*) All Projects with Positive NPV are selected,
   (*c*) Even Negative NPV Project may be selected,
   (*d*) At least two proposals are selected.

5. Reinvestment Rate Assumption is implied in :
   (*a*) Net Present Value,
   (*b*) Internal Rate of Return,
   (*c*) Both (*a*) and (*b*),
   (*d*) None of the above.
6. Payback Period Technique is based on :
   (*a*) All Cash Flows,
   (*b*) Only higher Cash Flows,
   (*c*) Earlier Cash Flows,
   (*d*) Selected Cash Flows.
7. In Capital Budgeting Decisions, a single cost of capital is used because :
   (*a*) Required Rate of Return is same for all projects,
   (*b*) It avoids calculation of Required Rate for different projects,
   (*c*) Both (*a*) and (*b*),
   (*d*) None of the above.
8. PI of a Project is the ratio of Present Value of Inflows to :
   (*a*) Initial Cost,
   (*b*) PV of outflows,
   (*c*) Total Cash inflows,
   (*d*) Total Outflows.
9. NPV of a proposal indicates :
   (*a*) Net Incremental Profit,
   (*b*) Net addition to Wealth,
   (*c*) Total Value of the Proposal,
   (*d*) None of the above.
10. NPV method and IRR method always give to mutually exclusive projects :
   (*a*) Same Ranking,
   (*b*) Different Ranking,
   (*c*) Inverse Ranking,
   (*d*) None of the above.
11. Which of the following method of evaluation of capital budgeting proposals focuses on liquidity?
   (*a*) Internal Rate of Return,
   (*b*) Net Present Value,
   (*c*) Accounting Rate of Return,
   (*d*) Payback Period.
12. In case of selection of mutually exclusive projects, the rule is:
   (*a*) Only the best one,
   (*b*) All the good ones,
   (*c*) All Positive NPV projects,
   (*d*) None of the above.
13. Which method of capital budgeting assumes that the cash flows are reinvested at project's rate of return?
   (*a*) Terminal Value,
   (*b*) Net Present Value,
   (*c*) Internal Rate of Return,
   (*d*) Accounting Rate of Return.
14. In case of risky projects, the required rate of return would generally be :
   (*a*) Higher,
   (*b*) Lower,
   (*c*) Same as for others,
   (*d*) None of the above.
15. Which of the following methods state the return from a project in percentage form?
   (*a*) Terminal Value Method,
   (*b*) Discounted Payback Method,
   (*c*) Internal Rate of Return,
   (*d*) Net Present Value.
16. Which of the following methods focuses on the maximization of wealth of shareholders?
   (*a*) Accounting Rate of Return,
   (*b*) Payback Period,
   (*c*) Profitability Index,
   (*d*) Internal Rate of Return.
17. Which of the following assumes that cash flows from a project are uniform throughout the life of the project?
   (*a*) Internal Rate of Return,
   (*b*) Net Present Value,
   (*c*) Profitability Index,
   (*d*) None of the above.
18. Project costing ₹ 8,00,000 and a life of 5 years is expected to bring cash inflows of ₹ 2,00,000 p.a. What is the payback period?
   (*a*) 5 years,
   (*b*) 4 years,
   (*c*) 3 years,
   (*d*) None of the above.
19. A project has a Profitability Index of 1.30. What does it mean?
   (*a*) That NPV is less than zero.
   (*b*) That Payback period is more than one year.
   (*c*) That the project returns ₹ 1.30 for every ₹ 1 invested in project.
   (*d*) That IRR is 1.30 times that of the Hurdle Rate.
20. Accounting Rate of Return is based on:
   (*a*) Average Expected Profit,
   (*b*) Average Past Profit,

(*c*) Average Cash Profit,

(*d*) Life of the Project.

21. NPV technique is based on:

(*a*) Discounting Procedure,

(*b*) Compounding Procedure,

(*c*) Averaging Procedure,

(*d*) None of the above.

22. Which of the following statement is correct with reference to Capital Budgeting?

(*a*) All Capital Budgeting techniques lead to same decision.

(*b*) Internal Rate of Return does not consider time value of money.

(*c*) NPV method is superior to payback method as the former considers time value of money.

(*d*) Cash flows of a project are calculated before tax.

23. Which of the following is likely to increase the NPV of a project?

(*a*) Increase in cost of capital,

(*b*) Decrease in working capital,

(*c*) Spreading cash flows over a longer period,

(*d*) Decreasing the net revenues.

24. If IRR of a project is equal to opportunity cost of capital, then:

(*a*) Project should be repeated,

(*b*) NPV will be zero,

(*c*) Project has no cash flows,

(*d*) NPV will be positive.

25. Number of IRR for a project is equal to:

(*a*) Number of Cash flows,

(*b*) Number of Cash Outflows,

(*c*) Life of the Project,

(*d*) Changes in the signs of cash flows.

[**Answers :** *1. (a), 2. (a), 3. (b), 4. (a), 5. (c), 6. (c), 7. (c), 8. (b), 9. (b), 10. (d), 11. (d), 12. (a), 13. (c), 14. (a), 15. (c), 16. (c), 17. (d), 18. (b), 19. (c), 20. (a), 21. (a), 22. (c), 23. (b), 24. (b), 25. (d)*]

ASSIGNMENTS

1. Write short notes on:

(*a*) Reinvestment Rate.

(*b*) Discounted Cash flow Methods.

(*c*) Discounted Payback Period.

2. How the concept of time value of money is applied to capital budgeting? What are the methods based on time value of money?

3. Cash flows of different time periods in absolute items are incomparable. Explain. [*B.Com. (H), D.U., 2013*]

4. Explain the traditional methods of evaluating long-term projects. [*B.Com. (H), D.U., 2017*]

5. "The pay back period is more a method of liquidity rather than profitability". Examine. [*B.Com. (H), D.U., 2006*]

6. How do you calculate the Accounting Rate of Return? Explain the treatment of depreciation in calculation of net investment. What are the limitations of ARR? [*B.Com. (H), D.U., 2009, 2011*]

7. "Despite being conceptually unsound, payback period is very popular in business as a criteria for assigning priorities to investment projects."*[B.Com. (H), D.U., 2008, 2012]*

8. Describe the concept of discounted cash flows in making investment decisions and its superiority over the traditional methods of investment evaluation.

9. Why do NPV and IRR techniques of evaluation of capital budgeting lead to conflicting project ranking ? *[B.Com. (H.), D.U., 2013]*

10. What is Profitability Index? Which is superior ranking criteria - PI or NPV? *[B.Com. (H), D.U., 2007, 2009, 2011, 2018]*

11. "The Terminal Value method overcome the shortcomings of the assumption of reinvestment rate". In the light of this statement, explain the procedure of this terminal value method.

12. Make a comparison between NPV and IRR methods. Which one of the two you find to be more rationale and why?

13. Examine the assumption of reinvestment rate with respect to the NPV method and the IRR method.

14. Explain Payback period method of capital budgeting. How does it differ from Profitability Index? *[B.Com. (H), D.U., 2007, 2010]*

15. Contrast IRR method with NPV method. Why might these two techniques lead to conflict in project ranking? *[B.Com. (H), D.U., 2008, 2009]*

16. While evaluating single project with convention cash flows, both NPV and IRR methods give identical decisions. Explain. *[B.Com. (H), D.U., 2013]*

17. Differentiate between Risk-adjusted Discount Rate and Certainty Equivalent methods of incorporation of risk in capital budgeting. *[B.Com. (H), D.U., 2008, 2010, 2012]*

18. What are similarities and dissimilarities between NPV and IRR? Which of the two methods will you prefer when they give different ranking of investment of proposals? Why *[B.Com. (H), D.U., 2015, 2016]*

19. Certainty Equivalent Approach is theoretically superior to the Risk Adjusted Discount Rate. Do you agree? *[B.Com. (H), D.U., 2017]*

PROBLEMS

P4.1 A company is considering an investment proposal to instal new milling controls. The project will cost ₹ 50,000. The facility has a life expectancy of 5 years and no salvage value. The company tax rate is 35%. The firm uses straight line depreciation. The estimated profit before depreciation from the proposed investment proposal are as follows :

Year	Profit
1	₹ 10,000
2	₹ 11,000
3	₹ 14,000
4	₹ 15,000
5	₹ 25,000

Compute the following :

(*a*) Pay back period.

(*b*) Average rate of return.

(*c*) Internal rate of return.

(*d*) Net present value at 10% discount rate.

(*e*) Profitability index at 10% discount rate.

[*Answer :* Pay back period 4.18 years; Average rate of return on average investment 13%; NPV ₹ –1,375; IRR of the project is 9.06% and the PI is .973.]

P4.2 Machine A costs ₹ 1,00,000, payable immediately. Machine B costs ₹ 1,20,000, half payable immediately and half payable in one year's time. The cash receipts expected are as follows :

(Figures in ₹)

Year (at the end)	A	B
1	₹ 20,000	—
2	60,000	₹ 60,000
3	40,000	60,000
4	30,000	80,000
5	20,000	—

With 7% cost of capital, which machine should be selected?

[*Answer :* B is having higher NPV and hence acceptable.]

P4.3 A machine costing ₹ 110 lacs has a life of 10 years, at the end of which its scrap value is likely to be ₹ 10 lacs. The firm's cut-off rate is 12%. The machine is expected to yield an annual profit after tax of ₹ 10 lacs, depreciation being reckoned on straight line basis. Ascertain the net present value of the project.

[*Answer :* The NPV of the project is ₹ 6,22,000.]

P4.4 XYZ Co. is considering the purchase of one of the following machines., whose relevant data are as given below :

(Figures in ₹)

		Machine X	Machine Y
Estimated life		3 years	3 years
Capital cost		90,000	90,000
Earnings (after tax) :	Year 1	40,000	20,000
	Year 2	50,000	70,000
	Year 3	40,000	50,000

The company follows the straight-line method of depreciation; the estimated salvage value of both the types of machines is zero. Show the most profitable investment based on (*i*) Pay back period, (*ii*) Accounting rate of return, and (*iii*) Net present value assuming a 10% cost of capital.

[*Answer :* The PB are 1.25 and 1.4 years; ARR are 96.3% and 103.7% and NPV are ₹ 92,280 and ₹ 98,130.]

P4.5 XYZ Ltd. is considering the purchase of new machine. Two alternative machines (A & B) have been suggested, each having initial cost of ₹ 10,00,000 and requiring ₹ 50,000 as additional working capital at the end of 1st year. Net cash flows are expected to be as follows :

Year	Machine A	Machine B
1	₹ 1,00,000	₹ 3,00,000
2	₹ 3,00,000	₹ 4,00,000
3	₹ 4,00,000	₹ 5,00,000
4	₹ 6,00,000	₹ 3,00,000
5	₹ 4,00,000	₹ 2,00,000

The company has target return on capital of 10% and on this basis you are required to compare the profitability of the machines and state which alternative you consider to be financially preferable.

[B.Com. (H.), D.U., 2013]

[*Answer :* NPV : ₹ 2,82,900 and ₹ 2,93,300. So, Machine B is better.]

P4.6 A company has to make a choice between two projects (A & B). The initial outlay of two projects are ₹ 2,70,000 and ₹ 4,80,000 respectively for A and B. The scrap values after 5 years are ₹ 10,000 and ₹ 30,000 respectively. The opportunity cost of capital of the company is 16%. The annual cash flows are as under :

Year	Project A	Project B
1	—	₹ 1,20,000
2	₹ 60,000	1,68,000
3	2,64,000	1,92,000
4	1,68,000	2,04,000
5	1,78,000	2,10,000

You are required to calculate :

(*i*) Payback Period

(*ii*) Profitability Index. *[B.Com. (H.), D.U. 2013]*

[*Answer :* Payback periods are 2.80 years and 3 years. PI are 1.467 and 1.205].

P4.7 Pioneer Steels Ltd., is considering two mutually exclusive projects. Both require an initial cash outlay of ₹10,000 each and have a life of five years. The company's required rate of return is 10% and pays tax at a 50% rate. The projects will be depreciated on a straight line basis. The profit before depreciation expected to be generated by the projects are as follows :

(Figures in ₹)

Year	1	2	3	4	5
Project 1	4,000	4,000	4,000	4,000	4,000
Project 2	6,000	3,000	2,000	5,000	5,000

You are required to calculate :

(*a*) The Payback of each project.

(*b*) The Average Rate of Return for each project.

(*c*) The Net Present Value and Profitability Index for each project.

(*d*) The Internal Rate of Returns for each project.

Which project should be accepted and why?

[*Answer :* For the two projects, the Pay back period are 3-1/3 years and 3-3/7 years; ARR are 20% and 22%; NPV are ₹1,373 and ₹1,767; IRR are 15.24% and 16.83% and the PI are 1.137 and 177 respectively. Project B seems to be better as per all the discounted cash flow techniques.]

P 4.8 A company is manufacturing a consumer product, the demand for which at current price is in excess of its ability to produce. The capacity of a particular machine, now due for replacement, is the limiting factor on production. The possibilities exist either of acquiring a similar machine (Project X) or of purchasing a more expensive machine with greater capacity (Project Y). The cash flows under each alternative have been estimated and given below. The company's opportunity cost of capital is 10%, after tax. In deciding between the two alternatives, the Managing Director favours the '*pay back method*'. The Chief Accountant, however, thinks that a more specific method should be used and he has calculated for each project:

(*i*) The Net Present Value.

(*ii*) The Profitability Index.

Having made these calculations, however, he finds himself still uncertain about which project to be recommended. You are required to make these calculations and to discuss their relevance to the decision to be taken.

The relevant cashflows from two projects are as follows:

	Cashflows	
	Project X	**Project Y**
Years 0	–₹ 27,000	–₹ 40,000
1	—	10,000
2	5,000	14,000
3	22,000	16,000
4	14,000	17,000
5	14,000	15,000

[*Answer:* NPV of the projects are ₹11,908 and ₹13,596; PI are 1.44 and 1.34 respectively.]

P 4.9 A firm has the following two proposals before it.

	Proposal I	**Proposal II**
Cost.	₹ 11,000	₹ 10,000
Cash Inflows:		
Years 1	₹ 6,000	₹ 1,000
2	2,000	1,000
3	1,000	2,000
4	5,000	10,000

Find out IRR of both the proposals, which proposal is acceptable if the required rate of return of the firm is (*i*) 11% or (*ii*) 10%.

[*Answer:* IRR of Proposal I is 11.26% and Proposal II is 10.22%. If the required rate of return is 11%, only Proposal I is acceptable. However, if the required rate of return is 10%, then both proposals are acceptable.]

P 4.10 ABC Ltd. is considering to replace one of its existing machines at a cost of ₹ 4,00,000. The existing machine can be sold at its book value *i.e.,* ₹ 90,000. However, it has a remaining useful life of 5 years with salvage value nil. It is being depreciated @ 20% WDV.

The new machine can be sold for ₹ 2,50,000 after 5 years when it will be no longer required. It will be depreciated by the firm @ 30% WDV. The new machine is expected to bring savings of ₹ 1,00,000 p.a. Should the machine be replaced given that (*i*) the tax rate applicable to firm is 50% and the required rate of return is 10% (Tax on gain/loss on sale of asset is to be ignored).

[*Answer :* The NPV of the replacement decision is ₹ 1,45,174. So, the firm may replace the machine].

PART III

FINANCING DECISION

Once the capital budgeting decisions have been made and proposals selected, the most important question before the financial manager is to arrange sufficient funds to finance them. Funds are also required to keep existing projects going on. Two basic sources of finance before a firm are the Equity (owners contribution) and the Debt (lenders investments). The relative proportion of these two sources on one hand, depends upon a host of factors such as legal, procedural and capital market considerations, and on the other, determines the financial risks of the firm. Each financing mix has its own leverage effect on the earnings per share as well as the total value of the firm. It may be noted that financing mix determines the cost of capital which is used to evaluate the capital budgeting proposals which in turn determine the value of the firm in the long run. There have been differing views on the relationship between financing mix, cost of capital and value of the firm. The most important and behaviourally justified view is one presented by Modigliani Miller Approach. In practice, the financial manager has to consider a host of factors and consideration before deciding a capital mix for the firm. Part III examines the leverage effect of the capital mix, impact of leverage on the EPS, differing views on relationship between capital mix and value of the firm. The learning objectives are

- How to find out the cost of capital for different sources of funds?
- What is the Operating Leverage and Financial Leverage for the firm?
- What would be the expected EPS under different financing mix?
- Is there any relationship between Leverage, Cost of Capital and Value of the firm?
- What is the tax implication of different capital mix?
- In practice, what are the factors that determines the capital structure of a firm?

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CHAPTER 5	:	COST OF CAPITAL
CHAPTER 6	:	FINANCING DECISION : LEVERAGE ANALYSIS
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CHAPTER

5

Cost of Capital

"Every profit seeking corporation has its own risk-return characteristics. Each group of investors in the corporation—bond holders, preferred stock holders, and common stock holders—requires a minimum rate of return commensurate with the risks it accepts by investing in the firm. From the standpoint of the corporation, these groups provide the capital needed to finance the firm's investments. The minimum rate of return that the corporation must earn in order to satisfy the overall rate of return required by its investors is called the corporation's cost of capital."[1]

SYNOPSIS

- Concept of Cost of Capital.
- Importance and Significance of Cost of Capital.
- Factors Affecting Cost of Capital.
- Implicit and Explicit Cost of Capital.
- Measurement of Cost of Capital.
  - Specific and Overall Cost of Capital.
- Cost of Long-term Debts and Bonds.
- Cost of Preference Share Capital.
- Cost of Equity Share Capital.
  - Cost of Capital under Different Dividends Assumptions.
  - Cost of Capital under CAPM.
- Cost of Retained Earnings.
- Weighted Average Cost of Capital.
  - Historical, Marginal and Target Weights.
  - Book Value and Market Value Weights.
- Marginal Cost of Capital.
- Graded Illustrations in Cost of Capital.

1. Neveu Raymond R., *Fundamentals of Managerial Finance*, Southern Western Publishing Co., Ohio, 1981, p. 334.

The concept of cost of capital is an important and fundamental concept of theory of financial management. In particular, the concept of cost of capital has two applications. First, in capital budgeting it is used to discount the future cash flows to obtain their present values, and second, it is also used in optimization of the financial plan or capital structure of a firm. The second aspect of the concept of cost of capital will be taken up in Chapter 8. In the present chapter, an attempt has been made towards the determination and measurement of this discount rate *i.e.*, the cost of capital besides analyzing other related aspects.

CONCEPT OF COST OF CAPITAL

A firm needs funds for various capital budgeting proposals. These funds can be procured from different types of investors *i.e.*, equity shareholders, preference shareholders, debt holders, depositors *etc.* These investors while providing the funds to the firm will have an expectation of receiving a minimum return from the firm. The minimum return expected by the investors depends upon the risk perception of the investor as well as on the risk-return characteristics of the firm. Therefore, in order to procure funds, the firm must pay this return to the investors. Obviously, this return payable to investors would be earned out of the revenues generated by the proposal wherein the funds are being used. So, the proposal must earn at least that much, which is sufficient to pay to the investors of the firm. This return payable to investor is therefore, the minimum return the proposal must earn otherwise, the firm need not take up the proposal.

The minimum rate of return that a firm must earn in order to satisfy the expectations of its investor is the cost of capital of the firm.

Importance and Significance : The importance and significance of the concept of cost of capital can be stated in terms of the contribution it makes towards the achievement of the objective of maximization of the wealth of the shareholders. If a firm's actual rate of return exceeds its cost of capital and if this return is earned without of course, increasing the risk characteristics of the firm, then the wealth maximization goal will be achieved. The reason for this is obvious. If the firm's return is more than its cost of capital, then the investor will no doubt be receiving their expected rate of return from the firm. The excess portion of the return will however be available to the firm and can be used in several ways *e.g.*, (*i*) for distribution among the shareholders in the form of higher than expected dividends, and (*ii*) for reinvestment within the firm for increasing further the subsequent returns. In both the cases, the market price of the share of the firm will tend to increase and consequently will result in increase in the shareholders wealth.

Moreover, the cost of capital when used as a discount rate in capital budgeting, helps accepting only those proposals whose rate of return is more than the cost of capital of the firm and hence results in increasing the value of the firm. Further, the cost of capital has a useful role to play in deciding the financial plan or capital structure of the firm. It may be noted that in order to maximize the value of the firm, the cost of all the different sources of funds must be minimized. The cost of capital of different sources usually varied and the firm will like to have a combination of these sources in such a way so as to minimize the overall cost of capital of the firm. This aspect has been discussed in detail in Chapter 8.

FACTORS AFFECTING THE COST OF CAPITAL

The cost of capital is the minimum expected rate of return of the investors or suppliers of funds to the firm. The expected rate of return depends upon the risk characteristics of the firm, risk perception of the investors and a host of other factors. Following are some of the factors which are relevant for the determination of cost of capital of the firm.

1. **Risk-free Interest Rate :** The risk free interest rate, I_f, is the interest rate on the risk free and default-free securities. For example, the securities issued by the Government of India are taken as risk free and default free in respect of payment of periodic interest as well as principal repayment on maturity. Theoretically speaking, the risk free interest rate, I_f, depends upon the supply and demand consideration in financial market for long term funds. The market sources of demand and supply determines the I_f, which is consisting of two components :

   (*a*) **Real Interest Rate :** The real interest rate is the interest rate payable to the lender for supplying the funds or in other words, for surrendering the funds for a particular period.

   (*b*) **Purchasing Power Risk Premium :** When a lender lends money, he in fact lends his present purchasing power in favour of the other party *i.e.*, borrower. After sometimes, when the lender gets the repayment, he recovers the same face value money. But if the prices have increased during the same period, then he is not getting back the same purchasing power which he lent. Investors, in general, like to maintain their purchasing power and therefore, like to be compensated for the loss in purchasing power over the period of lending or supply of funds. So, over and above the real interest rate, the purchasing power risk premium is added to find out the risk-free interest rate. Higher the expected rate of inflation, greater would be the purchasing power risk premium and consequently higher would be the risk free interest rate, I_{RF}.

2. **Business Risk :** Another factor affecting the cost of capital is the risk associated with the firm's promise to pay interest and dividends to its investors. The business risk is related to the response of the firm's Earnings Before Interest and Taxes, EBIT, to change in sales revenue. Every project has its effect on the business risk of the firm. If a firm accepts a proposal which is more risky than average present risk, the investor will probably raise the cost of funds so as to be compensated for the increased risk. This premium added for the business risk compensation is also known as business risk premium. There would obviously be a point at which the investor will not

like to supply the funds regardless of the return, the firm would be ready to pay.

3. **Financial Risk :** The financial risk is an other type of risk which can affect the cost of capital of the firm. The particular composition and mixing of different sources of finance, known as the financial plan or the capital structure, can affect the return available to the investors. The financial risk is often defined as the likelihood that the firm would not be able to meet its fixed financial charges. It is related to the response of the firm's earning per share to a variation in EBIT. The financial risk is affected by the capital structure or the financial plan of the firm. Higher the proportion of fixed cost securities in the overall capital structure, greater would be the financial risk. The investor in such a case require to be compensated for this increased risk. They add financial risk premium over and above the business risk premium.
4. **Other Considerations :** The investors may also like to add a premium with reference to other factors. One such factor may be the liquidity or marketability of the investment. Higher the liquidity available with an investment, lower would be the premium demanded by the investor. If the investment is not easily marketable, then the investors may add a premium for this also and consequently demand a higher rate of return.

In view of the above, the cost of capital may be defined as

$$k = I_{RF} + b + f \qquad (5.1)$$

where, k = Cost of capital of different sources.
I_{RF} = Risk free interest rate.
b = Business risk premium, and
f = Financial risk premium.

Equation 5.1 indicates that the cost of capital of a particular source of finance depends upon the risk free cost of capital of that type of funds, the business risk premium and the financial risk premium.

If a firm wants to raise funds by the issue of security then it must offer a return in the form of interest or redemption premium or expected dividends to the investors. Now, the investor before making a decision to invest the funds in the firm will compare the returns offered by the firm with the returns he can get elsewhere. In other words, the investor will be ready to supply the funds only if the firm offers a return which is at least equal to the opportunity cost of the investor. The opportunity cost of the investor may be defined as the return foregone by the investor on the alternative investment opportunity of the same or comparable risk. So, the cost of capital of the firm may be defined as the opportunity cost of the suppliers of funds *i.e.*, the investors.

The opportunity cost of the investors depends upon the nature and type of security being offered by the firm. Every investor has a risk perception regarding the risk inherent in different types of investment. As the risk increases, an investor may be ready to supply the funds only if sufficiently compensated for the risk. That is why the opportunity cost of the investor is not the same for different types of securities. Therefore, the cost of capital of the firm is not same for different types of securities. The firm has to offer different returns to the investors depending upon the risk of the security.

TYPES OF COST OF CAPITAL

Specific and Overall Cost of Capital : At a particular point of time, the firm might have raised funds from various sources *i.e.*, short term as well as long term. Conceptually, the cost of capital as a measure represents the combined cost of total funds being used by the firms. However, the short term sources of funds are kept outside the calculation of cost of capital as these short term sources *e.g.* bank credit, trade credit, bill *etc.*, are generally considered to be temporary in nature and are subject to repayment in the short run. Therefore, the cost of capital of a firm is calculated as the combined cost of long term sources of funds.

Moreover, all these long term sources have their own specific costs. The combined cost of capital depends upon these specific costs. The combined cost of capital is in fact, known as the overall cost of capital of the firm, while the specific costs are known as the specific cost of capital of a particular source. The long term sources of funds can be broadly categorized into (*i*) long term debt and loans, (*ii*) preference share capital (*iii*) equity share capital, and (*iv*) the retained earnings. The firm has a specific cost of capital for each of these sources and on the basis of these specific cost of capital, the overall cost of capital of the firm can be determined.

Normally, the capital funds come from a pool of different sources, none of the elements of which can or should be specifically identified with the particular proposals under review. Instead, any use of capital funds should reflect a firm's overall cost of capital. The capital expenditures are backed by the long term capital structure of a company, which may include different degrees of leverage. Thus, an overall cost of capital is an important criterion in the capital budgeting evaluation procedure. In the following discussion, an attempt has been made first, to measure the specific cost of capital of each source and second, how these specific costs of capital can be combined to produce a measure of overall cost of capital of the firm.

Explicit and Implicit Cost of Capital : The cost of capital of a firm can be analyzed as explicit cost and implicit cost of capital. The explicit cost of capital of a particular source may be defined in terms of the interest or dividend that the firm has to pay to the suppliers of funds. There is an explicit flow of return payable by the firm to the supplier of fund. For example, the firm has to pay interest on capital, dividend at fixed rate on preference share capital and also some expected dividend on equity shares. These payments refer to the explicit cost of capital.

However, there is one source of funds which does not involve any payment or flow *i.e.*, the retained earnings of the firm. The profits earned by the firm but not distributed among the equity shareholders are ploughed back and reinvested within the firm. These profits gradually result in a substantial source of funds to the firm. Had these profits been distributed to

equity shareholders, they could have invested these funds (return for them) elsewhere and would have earned some return. This return is foregone by the investors when the profits are ploughed back. Therefore, the firm has an implicit cost of these retained earnings and this implicit cost is the opportunity cost of investors. Thus, the implicit cost of retained earnings is the return which could have been earned by the investor, had the profit been distributed to them.

Except the retained earnings, all other sources of funds have explicit cost of capital. How to determine or measure the cost of capital ? This is discussed in the following section.

MEASUREMENT OF COST OF CAPITAL

The measurement of cost of capital refers to the process of determining the cost of funds to the firm. Once the cost has been determined, it is in the light of this cost that the capital budgeting proposal will be evaluated.

Just as the firm should carefully estimate the relevant cash flows associated with a proposal, it should also carefully estimate the cost of capital. If there is a mistake in the determination of the cost of capital, then the investment decision as well as other decisions may be taken wrongly and thus ultimately affecting the profitability and survival of the firm.

Thus, utmost care must be taken in the measurement of cost of capital, otherwise, unacceptable proposals might be selected and acceptable proposals might get rejection. Further, although the cost of capital is measured at a given point of time, it must reflect the cost of funds over the long run because the cost of capital is used in capital budgeting involving expenditures providing benefits in the long run.

Underlying Assumptions : The measurement of cost of capital is based on the following assumptions :

(*a*) The basic assumption of the cost of capital concept is that the business risk of the firm is unaffected by the proposal being evaluated at the cost of capital. The implication of this assumption is that every firm has a particular level of business risk as determined by the present composition of its fixed and variable costs. If a new proposal is also accepted then this business risk level is not going to be changed.

(*b*) Another assumption required to be made is that the financial risk of the firm remains unchanged, whether a proposal is accepted or not. The financial risk of the firm depends upon the degree of debt financing in the overall capital structure of the firm and this assumption implies that the same degree of debt financing will be maintained. The purpose of making this assumption is that for capital budgeting decision situations, the average cost of capital is used. This average cost of capital is calculated for a given capital structure. If there is a change in capital structure then this average cost of capital will also change.

Taxes and Cost of Capital : It is already discussed in Chapter 3 that the cash flows relevant for capital budgeting decisions are taken on an after-tax basis. These cash flows are then discounted at the cost of capital to find out their present value. It should be noted that this cost of capital which is used to discount the cash flows (after-tax) should also be after-tax only. If the firm is using IRR technique, then the cut-off rate should also be taken on an after-tax basis. This ensures consistency in the evaluation procedure. As discussed in the following sections, it is only the debt financing for which the tax adjustment to cost of capital is required. The reason being that interest on bonds and debentures is tax deductible. The other sources *i.e.*, the preference share capital and the equity share capital do not require such tax adjustment.

In the following discussion, the calculation of specific cost of capital for different sources has been taken up first, followed by calculation of Weighted Average Cost of Capital, WACC.

COST OF LONG-TERM DEBT AND BONDS

The cost of debts, bonds and debenture measures the current cost to the firm of borrowing funds to finance the projects. In general, it is determined by the following variables :

(*i*) The current level of interest rates. As the level of interest rates increases, the cost of debt for the firm will also increase,

(*ii*) The default risk of the firm. As the default risk of the firm increases the cost of bonds and debentures will also increase. One way of measuring the default risk is to use the bond rating for the firm; higher credit rating leads to lower interest rates, and lower rating leads to higher interest rates,

(*iii*) The tax advantages associated with the debt. Since, the interest is tax deductible, the after-tax cost of debt is a function of tax rate. The tax benefit that accrues from paying interest makes the after tax cost of debt lower than the pre-tax cost.

The cost of capital for debt may be defined as the returns expected by the potential investors of debt securities of the firm. In order to find out the cost of capital of debts, the following information is required :

(*a*) **Net Proceeds from the Issue :** This refers to the net cash inflow at the time of issue of debt. This can be calculated as :

$$B_0 = FV + Pm - D - F$$

where, B_0 = Net Proceeds

FV = Face Value of Debt

Pm = Premium charged on the issue of debt.

D = Discount allowed at the time of issue of debt, and

F = Flotation cost *i.e.*, the cost of raising funds including underwriting, brokerage and issue expenses.

For example, a debenture having a face value of ₹ 100 is issued at a discount of 5% and total issue of expenses are estimated at 5%, the net proceed *i.e.*, B_0 = ₹ 100 – ₹ 5 – ₹ 5 = ₹ 90. In case, the debenture is issued at a premium of 10%, then B_0 = ₹ 110 – ₹ 5.50 = ₹ 104.50 (note that the

flotation cost has been calculated at face value or the issue price whichever is higher).

(*b*) **Periodic Payments of Interest :** In most of the cases, (except in case of issue of Zero Interest Fully Convertible Debentures), the firm has to pay interest on debt instruments. To simplify the calculation of cost of debt, the interest amount is assumed to be payable annually. It may be noted that interest on debt is always payable on the face value irrespective of the issue price. For example, if the company issues 15% debentures, then the annual interest charge will be ₹ 15, irrespective of the fact whether the net proceeds, B_0, was ₹ 100 or more or even less.

Sometimes, the bonds and debentures as well as loans from financial institutions require regular repayments of the principal amount also. This periodic amortization of the principal amount is also considered as a cash outflow together with interest payment for a particular year.

(*c*) **Maturity Payment :** The principal amount of the debt instrument or loan (*i.e.*, the balancing figure after amortization, if any) will be payable by the firm on the maturity date. This may be paid together with the interest for the last year.

On the basis of the above information, the cost of capital for debt can now be ascertained as follows :

Cost of Capital of Perpetual Debt : The cost of capital of perpetual debt (*i.e.*, debt availed by the firm on a regular basis) may be ascertained as follows :

$$k_i = \frac{I\,(1-t)}{B_0} \qquad (5.2)$$

where, k_i = Cost of Capital of Debt (before tax)

I = Annual Interest Payable

B_0 = Net Proceeds

t = Rate of Tax

A few points are worth noting in Equation 5.2.

1. Equation 5.2 calculates the cost of capital of debt before tax. The tax adjustment will be taken up later.
2. The repayments (periodic amortization or maturity repayment) have not been considered as the debt is taken as perpetual. It may be noted that the concept of perpetual debt is theoretical in nature, otherwise debt, being a type of a loan is always repayable. Even if one debt is replaced by another, still there may be difference in interest rate of two debt instruments or difference in redemption amount and the net proceeds.

Tax Adjustment : An important aspect of cost of debt is the tax effect. As the interest on debt is tax deductible, the firm gets a saving in its tax liability. The interest works as a tax-shield and the tax liability of the firm is reduced. Thus, the effective cost of debt is lower than the interest paid to debt investors. The amount of tax savings and the effective cost of debt depend on the tax rate. The net cost of interest to the firm (at least for those with sufficient profits that are liable for taxes) is the annual interest multiplied by a factor of (1 – tax rate).

Cost of Capital of Redeemable Debt : The cost of capital of redeemable debt may be ascertained with the help of Equation 5.3.

$$B_0 = \sum_{i=1}^{n} \frac{I_i\,(1-t))}{(1+k_d)^i} + \frac{COP_i}{(1+k_d)^i} + \frac{COP_n}{(1+k_d)^n} \qquad (5.3)$$

where, I = Annual Interest Payment

B_0 = Net Proceeds

COP_i = Regular Cash Outflow on account of amortization

COP_n = Cash Outflow on account of repayment at maturity

k_d = After tax cost of capital of debt.

In case, the debt is repayable only at the time of maturity and there is no annual amortization then Equation 5.3 will not contain the second element *i.e.*, $COP_i/(1+k_d)^i$. Equation 5.3 is to be solved for the value of k_d, which will be after tax cost of capital for debt. This equation is to be solved by trial and error procedure (as the IRR equation was solved in Chapter 4).

Example 5.1

ABC Ltd. issues 12.5% debentures of face value of ₹ 100 each, redeemable at the end of 7 years. The debentures are issued at a discount of 5% and the flotation cost is estimated to be 1%. Find out the cost of capital of debentures given that the firm has 40% tax rate.

Solution :

For the given situation :

B_0 = ₹ 100 – ₹ 5 – ₹ l = ₹ 94.

I = ₹ 12.5 (1 – .4) = 7.50

Putting these values in Equation 5.3

$$94 = 9.50\,(PVAF_{(r,n)}) + 100(PVF_{(r,n)})$$

The value of right hand side of the equation is to be made equal to the amount of ₹ 94 and can be derived by trial and error procedure as follows :

at k_d = 9% = 7.50(5.033) + 100(.547)

= 37.75 + 54.70 = 92.45

Since the amount is less than ₹ 94, the rate of discount may be reduced to 8%, and

at k_d = 8% = 7.5(5.206) + 100(.583)

= 39.05 + 58.30 = 97.35

By interpolating between 8% and 9%, the value of k_d comes to 8.68%. So, the cost of capital (after tax) of debenture is 8.68%.

In order to avoid the cumbersome procedure of trial and error to find out the value of k_d in Equation 5.3, Equation 5.4 may be used to give an approximation to after tax cost of capital of debt.

$$k_d = \frac{I(1-t)+(RV-B_0)/N}{(RV+B_0)/2} \qquad (5.4)$$

where, RV = Redemption Value of debenture
k_d = After Tax Cost of Debt
t = Tax rate
N = Life of debenture

Now, applying Equation 5.4 for Example 5.1,

$$k_d = \frac{12.5(1-.4) + (100-94)/7}{(100+94)/2}$$

$$= .861 \text{ or } 8.61\%.$$

So, the value of k_d as given by Equation 5.4 provides an approximation to k_d. The exact value of k_d can however, be calculated only with the help of Equation 5.3. Moreover, Equation 5.4 can be used only when the debenture is to be redeemed at maturity.

Note : *Under the provisions of the Income-tax Act, 1961, the discount on issue of debentures or premium payable on redemption of debentures is deducted out of the taxable income of the company on proportionate basis over the life of the debentures. Hence, this tax deductibility provides a tax shield to the company. In the strict sense, this tax shield should be treated as a cash inflow for different years and be incorporated in the process of calculation of cost of capital of debentures. However, the present value of the annual tax shield of discount on issue and premium on redemption has been ignored for the sake of simplicity.*

Example 5.2

ABC Ltd. issues 15% debentures of face value of ₹ 1000 each at a flotation cost of ₹ 50 per debenture. Find out the cost of capital of the debenture which is to be redeemed in 5 annual instalments of ₹ 200 each starting from the end of year 1. The tax rate is 30%.

Solution :

For the given situation the net proceeds *i.e.*, B_0 is ₹ 1000 – 50 = ₹ 950. As the debenture is to be amortized in 5 instalments of ₹ 200 per year, the interest @ 15% will be payable only on the reduced balances as follows :

Year-end	Interest	Repayment	After tax Cash Flow
1	₹ 150	₹ 200	₹ 200 + 105 = ₹ 305
2	120	200	200 + 84 = 284
3	90	200	200 + 63 = 263
4	60	200	200 + 42 = 242
5	30	200	200 + 21 = 221

These after tax cash flows may be discounted at an appropriate rate, say, 12% and 13%, to be made equal to ₹ 900

i.e.

$$₹\ 950 = \frac{305}{(1+k_d)^1} + \frac{284}{(1+k_d)^2} + \frac{263}{(1+k_d)^3} + \frac{242}{(1+k_d)^4} + \frac{221}{(1+k_d)^5}$$

at k_d = 12%, the right hand side of the equation gives a value of ₹ 965.18.

at k_d = 13%, the right hand side of the equation gives a value of ₹ 943.91.

By interpolation between 12% and 13%, value of k_d comes to 12.71%.

The above discussion shows that the cost of capital of debt, k_d, increases as the net proceeds from the debt issue decreases because the investors have paid less to get the interest payment and the principal repayment. In Example 5.2, by paying ₹ 950 only and getting that ₹ 1,000, the investors have a capital gain which accrues to them proportionately every year. The rate of interest on the debenture is 15% and therefore, the after tax cost of debt should be 10.5% only. However, due to net proceeds of ₹ 950, the cost of debt (after tax) comes to about 12.71%. It is important to note that the adjustment in k_d occurs through the change in issue price. As the investors demand a higher return for the debt security, they will be willing to pay a lessor price for the security for any given set of interest and repayment terms.

COST OF PREFERENCE SHARE CAPITAL

Companies can raise funds by the issue of preference share capital also. The preference share capital is differentiated from equity share capital on account of two basic features, namely :

(*i*) the preference shares are entitled to receive dividends at fixed rate in priority over the equity shares, and

(*ii*) in case of liquidation of the company, the preference shareholders will get the capital repayment in priority over the distribution among the equity shareholders.

It may be noted that there is no obligation on the firm to compulsorily pay the preference dividend as the preference dividend is payable only when the sufficient profit are there and the company wants to pay dividends to equity shareholders also. The preference dividend is payable as an appropriation of profit unlike interest on debentures which is a charge against profits.

The understanding of cost of capital of preference share capital is conceptually difficult (as there is no legal binding to pay preference dividend) but the calculation does not pose much problem. The fixed rate of dividend on preference shares is the starting point for calculation of cost of capital of preference share capital. Conceptually, the preference shares may either be redeemable or irredeemable, the cost of capital may also be ascertained accordingly.

Cost of Capital of Redeemable Preference Shares : If the preference shares are redeemable at the end of a specific period, then the cost of capital of preference shares can be calculated by Equation 5.5 (which is very similar to Equation 5.3).

$$P_0 = \sum_{i=1}^{n} \frac{PD_i}{(1+k_p)^i} + \frac{RV}{(1+k_p)^n} \qquad (5.5)$$

where, P_0 = Net proceeds on issue of preference shares
PD = Annual preference dividend at fixed rate of dividend
RV = Amount payable at the time of redemption
k_p = Cost of preference share capital, and
n = Redemption period of preference shares.

Equation 5.5 is to be solved by the trial and error procedure to find out the value of k_p. In Equation 5.5, neither the k_p nor PD require any tax adjustment as the preference dividend is payable out of profit after tax and consequently there is no tax shield to the company.

Cost of Capital of Irredeemable Preference Shares : In case of irredeemable preference shares, the dividend at the fixed rate will be payable to the preference shareholder perpetually. The cost of capital of the irredeemable preference shares can be calculated with the help of Equation 5.6.

$$k_p = \frac{PD}{P_0} \qquad (5.6)$$

where, PD = Annual preference dividend

P_0 = Net proceeds on issue of preference shares

k_p = Cost of capital of preference shares.

It may be noted that in India, no company can issue irredeemable preference shares after 1988 (Section 55 of the Companies Act, 2013).

Example 5.3

ABC Ltd. issues 15% Preference shares of the face value of ₹ 100 each at a flotation cost of 4%. Find out the cost of capital of preference share if (*i*) the preference shares are irredeemable, and (*ii*) if the preference shares are redeemable after 10 years at a premium of 10%.

Solution :

If the preference shares are irredeemable then the cost of capital is :

$$k_p = \frac{15}{96} = 15.63\%.$$

If the preference shares are redeemable then the cost of capital, k_p, may be calculated by solving the following equation :

$$P_0 = \sum_{i=1}^{10} \frac{15}{(1+k_p)^i} + \frac{110}{(1+k_p)^{10}}$$

At k_p = 16%, the right hand side of the equation may be written as :

$$= 15(PVAF_{(16\%,10)}) + 110(PVF_{(16\%,10)})$$
$$= 15(4.833) + 110(.227)$$
$$= ₹\ 97.46$$

As the value is more than ₹ 96, the rate of discount may be increased to 17%.

At k_p = 17%, the right hand side of the equation may be written as :

$$= 15(PVAF_{(17\%,10)}) + 110(PVF_{(17\%,10)})$$
$$= 15(4.659) + 110(.208)$$
$$= ₹\ 92.76.$$

By interpolating between 16% and 17% the value of k_p comes to 16.31% as follows :

$$k_p = 16\% + \frac{(97.46 - 96)}{(97.46 - 92.76)} \times 1 = 16.31\%$$

It may be noted that the cost of capital of preference share, k_p, is higher *i.e.*, 16.31% when it is redeemable after 10 years at 10% premium. The reason for this is the premium payable at the time of redemption. In the same case, if the premium is not payable at the time of redemption and the preference share is redeemable, instead, at ₹ 96 only, then the cost of capital will be as follows :

At k_p = 16%, the right hand side of the equation may be written as :

$$= 15(PVAF_{(16\%,10)}) + 96(PVF_{(16\%,10)}$$
$$= 15(4.833) + 96(.227) = ₹\ 94.27$$

As the value is less than ₹ 96, the rate of discount may be decreased to 15%.

At k_p = 15%, the right hand side of the equation may be written as :

$$= 15(PVAF_{(15\%,10)}) + 96(PVF_{(15\%,10)})$$
$$= 15(5.019) + 96(.247) = ₹\ 98.99$$

By interpolating between 15% and 16% the value of k_p comes to 15.63%.

So, the cost of capital is same at 15.63% as it was when the preference shares were treated as irredeemable. However, if the preference shares are redeemable at par *i.e.*, ₹ 100, then k_p comes to 15.83%. This increase in cost of capital from 15.63% to 15.83% arises because of premium of ₹ 4 payable at the time of redemption. This premium is a gain to shareholders but reflect a cost to the company as indicated by the increase in cost of capital.

Approximation to k_p : An approximation to k_p can be quickly obtained by using the following formulation :

$$k_p = \frac{PD + (P_n - P_0)/N}{(P_n + P_0)/2}$$

In case the preference share is issued at a net proceed of ₹ 96 and is redeemable at par at the end of year 10, then

$$k_p = \frac{15 + (100 - 96)/10}{(100 + 96)/2} = 15.71\%$$

Note : *The calculation of k_p as presented in Equation 5.5 is a standard model in financial management. This, however, may be adjusted in the light of the relevant tax provisions. In India, the company paying preference dividend, has to pay a Dividend Distribution Tax. Say, a company declares preference dividend of ₹ 2 per share and the rate of Dividend Distribution Tax is 20%, then the company has to pay 40 paise tax to the Government, and therefore the total cash outflow of the company would be ₹ 2.40. So, in Equations 5.5 and 5.6, the term PD may be accordingly adjusted to incorporate the effect of Dividend Distribution Tax.*

In Example 5.3, Preference Dividend (PD) has been taken as ₹ 15. If the Corporate Dividend tax is taken @ 20%, then the

value of PD would be taken as 15 (1+.2) = ₹ 18, and k_p would be :

$$k_p = \frac{PD\,(1+t)}{P_0} = \frac{15(1+.2)}{96} = 18.75\%$$

It may be noted that due to the payment of Dividend Distribution Tax, the k_p has increased from 15.63% to 18.75%. Similarly, if the preference shares are redeemable, then the value of PD will be increased from ₹ 15 to ₹ 18, and the k_p can be calculated accordingly.

COST OF EQUITY SHARE CAPITAL

The measurement of cost of capital of equity share capital is the most typical and conceptually a difficult exercise. The reason being that there is no coupon rate in case of equity shares. In case of cost of capital of debt and preference share capital, the rate of interest and the rate of dividend were the starting point respectively. However, no such starting point is available for cost of equity share capital. Further, there is no commitment to pay equity dividend and it is the sole discretion of the Board of Directors to pay or not to pay dividend or to decide at what rate the dividend be paid to the equity shareholders.

In case of debt and preference share capital, the return from the firm was known in the form of coupon rate but in case of equity share capital, the investor must be able to find out the expected return from the firm. The return in case of equity shares is available basically, in the form of dividends from the firm. Therefore, the potential investors of equity share capital must estimate the expected stream of dividend from the firm. This stream of dividends may then be discounted to get the present value of such stream. The rate of discount at which the expected dividends are discounted to determine their present value is known as the cost of equity share capital.

In the case of equity share, the cost has to be viewed in the opportunity framework. The investor has provided funds to the firm expecting to receive the combined return of dividends and the appreciation in market value. The investment was made, presumably on a logical basic, because the type of risk embodied in the firm reasonably matched with the investor's on risk preference and because the expectations about earnings, dividends and market appreciation were satisfactory. The investor made this choice by foregoing other investment opportunities. The problem of measuring, the cost of equity capital to a firm arises from the need to measure the investor's expectations about the risk and return in relation to the firm.

Theoretically speaking, the present market value of a share is a function of the returns expected by the shareholders and the risk associated with the share. This is based on the premise that the market price of a share is equal to the present value of all expected future dividends on the share *plus* the sale proceeds realized when the share is sold. This is represented in Equation 5.7.

$$P_0 = \frac{D_1}{(1+k_e)^1} + \frac{D_2}{(1+k_e)^2} + \text{----------} + \frac{D_n}{(1+k_e)^n} + \frac{P_n}{(1+k_e)^n} \qquad (5.7)$$

where, P_0 = Current Market Price of Equity Share
P_n = Share market price after year n
D_i = Dividends receivable over different years
k_e = Required rate of return of the shareholder or cost of equity share capital.

In Equation 5.7 and the subsequent discussion, it has been assumed that equity dividends are payable only annually. Equation 5.7 does not seem to be practical one as it requires to ascertain the market price at the end of year n, when the share is eventually sold. However, the share price at year 'n' is itself the present value of all the future expected dividends *plus* the subsequent sale proceeds. The sale of a share and the selling price thereof can be seen as merely transferring the right of future dividends for a price. The share price, therefore at any time can be taken as the present value of all the future expected dividends infinitely. Thus, Equation 5.7 may be modified to write as Equation 5.8.

$$P_0 = \frac{D_1}{(1+k_e)^1} + \frac{D_2}{(1+k_e)^2} \text{ ---------- } + \frac{D_n}{(1+k_e)^n} + \text{ ---------- } + \frac{D_\infty}{(1+k_e)^\infty} \qquad (5.8)$$

In Equation 5.8, the value of k_e is the cost of equity share capital *i.e.*, the discount rate which will equate the discounted value of all future expected dividends with the present market value of the share. Now, the estimation of future expected dividends is the most important input required for calculation of k_e. The other variable *i.e.*, the current market price, P_0, can be easily known from the stock market data. There can be different assumptions regarding the expected behaviour of future dividends and under each of such assumption, the value of k_e, can be ascertained. These assumptions and the calculation of k_e have been taken up as follows :

Zero-Growth Dividends : It may be assumed that dividends will remain constant and pegged at the current level for the assumed perpetual life of the firm. In such a case, the dividend stream is treated as a perpetuity of dividends and the cost of equity share capital, k_e can be ascertained with the help of Equation 5.9.

$$k_e = \frac{D_1}{P_0} \qquad (5.9)$$

where, k_e = Cost of equity share capital
D_1 = Expected dividend at the end of year 1
P_0 = Current market price of the share.

Impliedly, zero growth dividend means that the firm is following policy of 100% dividend pay out ratio and no profits are retained by the firm. Under such a situation, the D_1 will be equal to EPS_1 of the firm. In other words, when earnings are constant and the dividend pay out ratio is 100%, then

$E_1 = E_2 = E_3$ ---------- E, and

$D_1 = D_2 = D_3$ ---------- D and therefore, E = D.

On the basis of Equation 5.9, and E = D,

$$k_e = \frac{E_1}{P_0}$$

It may be noted on the basis of this equation that $k_e = 1(P_0/E_1)$ and therefore, **k_e may also be defined as inverse of the PE ratio.**

Constant Growth Rate in Dividends perpetually : Dividends may be assumed to grow at a constant rate, say, 'g' per cent per annum. In such a case, the dividend payment in year n can be expressed as :

$$D_n = D_0(1+g)^n$$

and the present market price of the share can be shown as in Equation 5.10

$$P_0 = \frac{D_0(1+g)}{(1+k_e)^1} + \frac{D_0(1+g)^2}{(1+k_e)^2} + \text{---} + \frac{D_0(1+g)^\infty}{(1+k_e)^\infty} \quad (5.10)$$

The only condition before applying Equation 5.10 is that $k_e > g$. Note that in Equation 5.10, the dividend amount will get larger and larger as the time passes because of the growth factor, g. This is clearly different from the debts, preference share capital and the zero growth dividend streams. Mathematically, Equation 5.10 can be further simplified and written as Equation 5.11.

$$P_0 = \frac{D_0(1+g)}{k_e - g} = \frac{D_1}{k_e - g} \quad (5.11)$$

$$\text{or,} \quad k_e = \frac{D_1}{P_0} + g \quad (5.12)$$

Equation 5.12 can be interpreted as that the cost of equity share capital k_e is the present dividend yield *plus* the growth rate, g.

Equation 5.12 tells that k_e has two components. The first, D_1/P_0 is called the dividend yield. This is calculated as the expected cash dividend divided by the current price, so, it is similar to current yield on a bond. The second part is the growth rate, g, which refers to capital gains yield.

Example 5.4

ABC Ltd. has just declared and paid a dividend at the rate 15% on the equity share of ₹ 100 each. The expected future growth rate in dividends is 12%. Find out the cost of capital of equity shares given that the present market value of the share is ₹ 168.

Solution :

The cost of equity capital in the case may be ascertained by using the Equation 5.11.

$$P_0 = \frac{D_0(1+g)}{k_e - g}$$

$$168 = \frac{15(1+.12)}{k_e - 12}$$

$$\text{or, } k_e = \frac{16.8}{168} + .12 = .22 \text{ or } 22\%$$

The formulations given in Equations 5.11 and 5.12 are subject to the following assumptions :

1. That the current market price of the share is a function of future expected dividends.
2. D_0 is > 0, *i.e.*, the present dividend is positive.
3. The dividend pay out ratio is constant.

Varying Growth Rate in Dividends : Dividends may also be assumed to grow at different rates for different years. For example, for first 5 years the growth rate may be 10% per annum, then for the next 5 years the growth rate may be 15% per annum and thereafter the dividends may grow at 20% per annum infinitely. This means that the dividend will grow at 10% per annum, for years 1 to 5, and at 15% for years 6 to 10 and at 20% for the year 11 and thereafter. Equation 5.10 can be modified to take care of such situations of dividend stream and the cost of capital may therefore be calculated with the help of Equation 5.13.

$$P_0 = \sum_{i=1}^{5} \frac{D_0(1+g_1)^i}{(1+k_e)^i} + \sum_{i=6}^{10} \frac{D_5(1+g_2)^{i-5}}{(1+k_e)^i} \cdots\cdots\cdots + \sum_{i=11}^{\infty} \frac{D_{10}(1+g_3)^{i-10}}{(1+k_e)^i} \quad (5.13)$$

where, P_0 = Current market price of the equity share

D_0 = Dividend just paid by the company

D_5 = Dividend payable at the end of year 5

D_{10} = Dividend payable at the end of year 10

g_1, g_2 and g_3 = Different growth rates, and

k_e = Cost of equity share capital.

Equation 5.13 can be solved by trial and error procedure to find out the value of k_e.

Note : *Calculation of k_e as per Equations 5.7 to 5.13, is a standard formulation in financial management. This however, may be adjusted in the light of relevant tax laws. In India, Equity Dividend is subject to Dividend Distribution Tax. For example, a company declares a dividend of ₹ 5 on equity shares, then it has to pay Dividend Distribution Tax to the Government. In the above equations, the term D_1 may be replaced by $D_1 (1 + t)$ where 't' is the Dividend Distribution Tax Rate.*

In Example 5.4, the value of k_e may be calculated with Dividend Distribution Tax as follows :

$$k_e = \frac{D_1(1+t)}{P_0} + g = \frac{16.8(1+.2)}{168} + .12 = 24\%$$

It may be observed that the k_e has increased from 22% to 24% as a result of inclusion of Dividend Distribution Tax.

Zero Dividends : It may also be assumed that the firm may not pay any dividend and instead reinvests its entire earnings. In such a case, where there is no current dividend or expected dividend for year 1, Equations 5.9, 5.10, 5.11 and 5.13 cannot be used to find out the value of k_e. The investors, even if no dividend is expected, will not change their required rate of return. Instead, the investor must be expecting a capital gain in the form of increase in market price. Thus, the required rate of return accrues to the investors in the form of capital gain which they receive when they sell their shares at a later date at a price say, P_n, against the current price, P_0. In such a case, the cost of capital, k_e, may be calculated with the help of Equation 5.14.

$$P_0 = \frac{P_n}{(1+k_e)^n} \qquad (5.14)$$

An important assumption in Equation 5.14 is that $P_n > P_0$. The value of k_e in Equation 5.14 can be derived as :

$$k_e = \sqrt[n]{(P_n \div P_0)} - 1$$

The main problem in applying this equation and Equation 5.14 is that it is difficult, if not impossible to estimate value of P_n *i.e.*, the expected market price at the end of year n.

Cost of Capital of Newly Issued Capital or External Equity : A firm may face a situation where it needs to raise funds by issue of fresh equity capital in order to finance the new projects. If so, then what return must be earned on these funds raised by fresh issue to make the project worthwhile. The existing equity share capital expect the firm to pay a stream of dividends and this stream of dividends is earned from the existing assets. The new equity capital will also likewise expect to receive the same quantum of returns. Obviously, for new shares to obtain the same stream as that on existing shares, the new funds obtained from the issue of fresh capital must be utilized to produce a return high enough to provide a dividend stream whose present value is just equal to the net proceeds of fresh issue. In other words, the minimum rate of return which the new shares expect in order to prevent a decline in the market price of existing shares, is the cost of fresh equity.

Theoretically speaking, the firm should therefore, sell the new shares at the current market price of existing equity shares. However, in practice, the net proceeds to the firm will be reduced as the firm will be required to bear additional expenses of flotation including underwriting expenses, brokerage, issue expenses, advertisement and above all a discount off the current price to the potential investor to induce them to subscribe all the shares offered. Thus, the net proceeds will be reduced below the current market price for (*i*) the flotation cost and (*ii*) offer price being below the current market price.

The cost of new equity shares can be estimated on the basis of Equation 5.12 by determining the net proceeds after flotation cost *etc.*, and taking the assumption of constant growth rate as follows :

$$k_n = \frac{D_1}{NP} + g$$

where, NP = Net proceeds from fresh issue, and

k_n = Cost of new equity.

It may be noted that this equation is almost the same as Equation 5.12 except that P_0 is replaced by NP and NP is $< P_0$ because of flotation cost. The k_n will always be higher than k_e because the net proceeds from fresh capital, NP, will always be lower than the current market price, P_0.

Example 5.5

The share of ABC Ltd. is presently traded at ₹ 50 and the company is expected to pay dividends of ₹ 4 per share with a growth rate expected at 8% per annum. It plans to raise fresh equity share capital. The merchant banker has suggested that an under pricing of Rupee 1 is necessary in pricing the new issue besides involving a cost of 50 paise per share on miscellaneous expenses. Find out the cost of existing equity shares as well as the new equity given that the dividend rate and growth rate are not expected to change.

Solution :

In the given case, the following information is available.

Market price, P_0	=	₹ 50 per share
Under pricing	=	₹ 1 per share
Flotation cost	=	Paise 50 per share
Net proceed, NP	=	₹ 50–1–.50 = ₹ 48.50
Growth rate, g	=	8%
D_1,	=	₹ 4

Cost of capital of existing capital :

$$k_e = \frac{D_1}{P_0} + g = \frac{4}{50} + .08 = .16 \text{ or } 16\%$$

Cost of capital for fresh equity :

$$k_n = \frac{D_1}{NP} + g = \frac{4}{48.50} + .08 = .1625 \text{ or } 16.25\%$$

Cost of Equity Share Capital under CAPM : Any rate of return, including the cost of equity capital is affected by the risk. If an investment is more risky, the investor will demand higher compensation in the form of higher expected return. The equity shareholders receive dividends after interest have been paid to the debt holders and preference dividends have been paid to preference shareholders. This means that their return will be volatile with reference to the change in company's performance. The cost of equity capital will be higher than that of other sources to reflect this risk. The risk factor is incorporated in the calculation of cost of equity capital above as it will be reflected in the market price of the share. A risky

company will have a relatively lower share price and hence a higher cost of equity capital. A less risky company will be more valuable and commands a higher share price and hence a lower cost of equity capital.

The cost of capital of equity shares, as already noted, is the rate that the equity investors require to provide equity funds to a firm. There are two basic approaches to estimate the cost of equity capital. The first of these *i.e.*, dividend growth model has already been discussed in the previous section. There is an alternative to the dividend based calculation of the cost of equity and this alternative, known as CAPM model, is based directly upon the risk consideration. It is possible to find out the cost of equity capital by using the mechanism of risk-return trade off as given by the Capital Assets Pricing Model (CAPM).

The CAPM classifies the total risk associated with a security/ asset into two classes *i.e.*, (*i*) the diversifiable or unsystematic risk, and (*ii*) non-diversifiable or systematic risk. The diversifiable risk refers to that risk which can be eliminated by more and more diversification. On the other hand, non-diversifiable risk is that risk which affect all the firms at a particular point of time and hence cannot be eliminated *e.g.*, risk of political uncertainties, risk of Government policies, *etc.*

An investor can eliminate the diversifiable risk by diversifying into more and more securities, however, the non-diversifiable risk is the point where the investor's attention is required. This non-diversifiable risk of a security is measured in relation to the market portfolio and is denoted by the beta coefficient, β. In order to estimate the required rate of return of the equity investors, the risk associated with the shares (as represented by the beta factor) need to be estimated. The CAPM as applied to find out the cost of capital of equity shares can be presented as follows :

$$k_e = I_{RF} + \beta(k_m - I_{RF})$$

where, k_e = Cost of capital of equity shares
I_{RF} = Risk free interest rate
β = The beta factor *i.e.*, the measure of non-diversifiable risk,
k_m = The expected rate of return of the market portfolio or average rate of return on all assets.

For example, a firm having beta coefficient of 1.8 finds the risk free rate to be 8% and the market cost of capital at 14%. The cost of capital of equity shares of the firm will be :

$$\begin{aligned} k_e &= I_{RF} + \beta(k_m - I_{RF}) \\ &= .08 + 1.8(.14 - .08) \\ &= .188 \text{ or } 18.8\%. \end{aligned}$$

In order to apply the CAPM, the firm has to estimate (*i*) the risk free rate, (*ii*) the rate of return on market portfolio and (*iii*) the beta factor. Moreover, it is based upon the crucial assumption that the investors can easily eliminate the diversifiable risk and hence require compensation for the non-diversifiable risk only, and this risk is reflected in the beta factor.

The dividend basis of cost of capital and the CAPM based cost of capital are different in more than one ways. First, the former does not consider any risk explicitly while the latter considers the risk associated with a security through the beta factor, β. Secondly, the CAPM ignores and is not capable of adjusting itself to any external variable such as flotation cost or growth in dividends *etc.*, whereas the dividend based cost of capital can easily accommodate these variables.

COST OF RETAINED EARNINGS

Earnings generated by a firm are distributed among the equity shareholders. However, if the entire earnings are not distributed and a part is retained by the firm, then these retained earnings are available for reinvestment within the firm. As the retained earnings increase the shareholders equity in the same way as the new issue of equity share capital would do, the retained earnings are often considered as subscription to additional share capital by existing equity shareholders. However, the firm is not required to pay dividend on this part of shareholders funds (*i.e.*, the retained earnings portion), so it may be argued that the retained earnings have no cost as such. But this is not true.

The cost of retained earnings must be considered as the opportunity cost of the foregone dividends. From the point of view of equity shareholders, any earning retained by the firm could have been profitably invested by the equity shareholders themselves, had these been distributed to them. Thus, there is an opportunity cost involved in the firms retaining the earnings and an estimation of this cost can be taken up as a measure of cost of capital of retained earnings, k_r.

The cost of retained earnings, k_r, is often taken as equal to the cost of equity share capital, k_e, since the retained earnings are viewed as the fresh subscription to the equity share capital. If a firm has to decide whether to raise funds by issuing new equity shares or by retaining the earnings, it will have to find out the rate of return at which the investors will be indifferent between whether the firm distributes the earnings or reinvests these earnings for future growth. This is reflected in market price of the share which is used to determine the cost of equity. If the investors are not getting the expected returns from the firm's reinvestment, they will tend to sell their holding, forcing down the price until they get the expected return. By lowering the share price, the investors maintain the required rate of returns. Therefore, the share price fully reflect the cost of capital of the retained earnings. So, $k_r = k_e$. It may be noted that the cost of retained earnings is not to be adjusted for tax, for flotation cost and for the under pricing. While retaining the earnings, the firm does not in any way incur any such cost and the earnings to be retained are already after tax.

WEIGHTED AVERAGE COST OF CAPITAL

Once the specific cost of capital of each of the long term sources *i.e.*, the debt, the preference share capital, the equity share capital and the retained earnings have been ascertained, then the next step is to calculate the overall cost of capital of the firm. This overall cost of capital of the firm is relevant as this rate is used as the discount rate or the cut-off rate in evaluating the capital budgeting proposals. The overall

cost of capital may be defined as the rate of return that must be earned by the firm in order to satisfy the requirements of different investors. The overall cost of capital is thus, the minimum required rate of return on the assets of the firm. This overall cost of capital should take care of the relative proportion of different sources in the capital structure of the firm. Therefore, this overall cost of capital should be calculated as the weighted average rather than simple average of different specific cost of capital. The weighted average cost of capital (WACC) is defined as the weighted average of the cost of different sources and may be described as follows :

$$WACC = k_e.w1 + k_d.w2 + k_p.w3 + k_r.w4 \quad (5.15)$$

where, WACC = Weighted Average Cost of Capital

k_e = Cost of Equity capital

k_d = After tax cost of Debt

k_p = Cost of Preference shares

k_r = Cost of Retained earnings

w1 = Proportion of Equity capital in capital structure

w2 = Proportion of Debt in capital structure

w3 = Proportion of Preference capital in capital structure.

w4 = Proportion of Retained earnings

As most of the firms use more than one source of capital fund in financing the capital budgeting proposals and because over time, the mix of these sources may change, it is necessary to examine the cost of the firm's capital structure as a whole. The firm must have a cost of capital that is weighted to reflect the differences in various sources used. It encompasses the cost of compensating the debt investors, preference shareholders and the equity shareholders. So, in order to calculate the WACC, there must be a system of assigning weights to different specific cost of capital. The following considerations are worth noting while assigning weights to specific cost of capital to find out the WACC.

Historical, Marginal and Target Weights : As already noted, the WACC is found by weighing the specific cost of capital for each type of financing by its proportion in the overall capital structure. The weights which may be assigned and used to find out the WACC may be as follows :

(*a*) **Historical or Existing Weights :** Historical or existing weights are the weights based on the actual or existing proportions of different sources in the overall capital structure. Such weighing system is based on the actual proportions at the time when the WACC is being calculated. In other words, the weighing system is the proportion in which the funds have already been raised by the firm. The use of historical weights is based on two important assumptions namely (*i*) that the firm would raise the additional resources required for financing the investment proposals, in the same proportions in which they are appearing at present in the capital structure, and (*ii*) that the present capital structure is optimal and therefore the firm wants to continue with the same pattern in future also.

However, there may be some problems in applying the historical weights. The firm may not be able to raise additional finance in the same proportion as existing one because of prevailing economic and capital market conditions, legal constraints or other factors. Further, the assumption of existing capital structure being the optimal one may not always hold good.

(*b*) **Marginal Weights :** The marginal weights refer to the proportions in which the firm wants or intends to raise funds from different sources. In other words, the proportions in which additional funds required to finance the investment proposals will be raised are known as marginal weights. So, in case of marginal weights, the firm in fact, calculates the WACC of the incremental funds. Theoretically, the system of marginal weights seems to be good enough as the return from investment will be compared with the actual cost of funds. Moreover, if a particular source which has been used in the past but is not being used now to raise additional funds, or cannot be used now, for one or the other reason, then why should it be allowed to enter the decision process even through the weighing system. WACC calculated on the basis of marginal weights is also known as Weighted Marginal Cost Capital (WMCC).

(*c*) **Target Weights :** The target weights refer to the proportion in which the firm plans to raise the funds from various sources in the long run. In other words, the target weights system reflects the desired long term financial plans or capital structure of a firm. In the target weights system, the firm in the first instance, decides about the shape of the optimal capital structure and proportion of different sources in this optimal capital structure. This, then, will be achieved by the firm in the long run. At a particular point of time, the actual capital structure may not be the optimal capital structure, but in the long run, the firm intends to shape it as an optimal capital structure.

If a firm already has an optimal capital structure, then its historical weights will be equal to the target weights. Unless a firm's existing capital structure significantly differs from the optimal capital structure, the WACC using historical weights is not expected to be different from the WACC using target weights. Theoretically speaking, the use of the target weights is the best option as this system incorporates the long term perspective of the firm. In the following discussion, therefore, the target weights system will be used to find out the WACC.

Book Value and Market Value Weights : The weights to be used for calculation of WACC can either be based on the book value or the market value of the funds raised from different sources.

(*a*) **Book Value Weights :** The weights are said to be book value weights if the proportions of different sources are ascertained on the basis of the face values *i.e.*, the accounting values. The book value weights can be easily

calculated by taking the relevant information from the capital structure as given in the balance sheet of the firm.

The book value weights are considered as a sound weighing system as it is operational in nature and a firm may design its capital structure in terms of as it appears in the balance sheet. However, the book value weights system does not truly reflect the economic values. In fact, the weighing system should be market determined. The book value weights system is not consistent with the definition of the overall cost of capital, which is defined as the minimum rate of return needed to maintain the firm's market value. The book value weights ignore the market values.

(*b*) **Market Value Weights :** The weights may also be calculated on the basis of the market value of different sources *i.e.*, the proportion of each source at its market value. In order to calculate the market value weights, the firm has to find out the current market price of the securities in each category. However, a problem may arise if there is no market value available for a particular type of security. The advantages of using the market value weights may be :

(*i*) The market value weights are consistent with the concept of maintaining market value in the definition of the overall cost of capital.

(*ii*) The market value weights provide current estimate of the investor's required rate of return,

(*iii*) The market value weights yield good estimate of the cost of capital that would be incurred should the firm require additional funds from the market.

However, the market value weights suffer from some limitations as follows :

(*i*) Not only that the market value of all types of securities issued have to be obtained but also that the market value of equity share is to be segregated into capital and retained earnings.

(*ii*) The market values are subject to change from time to time and so the concept of optimal capital structure in terms of market value does not remain relevant any longer.

(*iii*) External factors which affect the market value, will affect the cost of capital also and therefore, the investment decision process will be influenced by the external factors.

The weights to be assigned to different sources of funds are clearly going to be different if the financial analyst choose to apply current market value weights as against the book values as stated in the balance sheet. He must be guided by the purpose of the analysis in deciding which value is relevant. If he is deriving a criterion against which to judge the expected return from future investment, he should use the current market value of different sources. The investors, certainly, do not invest in the book value of the equity shares, which may differ significantly from the market values. The book values are static and not responsive to changing performance. It may be noted that the market value of equity shares automatically includes these retained earnings as reported in the balance sheet.

With respect to the choice between the book value and market value weights, the following points are worth noting :

(*a*) It is argued that the book value is more reliable than market value because it is not as volatile. Although it is true that book value does not change as often as market value, this is more a reflection of the weakness than of strength, since the true value of the firm changes over time as both the firm specific and the market related information is revealed.

(*b*) The WACC based on market value will generally be greater than the WACC based on book values. The reason being that the equity capital having higher specific cost of capital usually has market value above the book value. However, this is not the rule.

(*c*) The choice between the book value and the market value is relevant only for historical and target weights. In case of marginal weights, however, the question of choice does not arise at all and the weighing system will be market value based only.

The procedure for calculation of WACC has been explained with the help of Example 5.6.

Example 5.6

The following is the capital structure of ABC Ltd.

Source	Amount	Specific C/C
Equity Share Capital (2,00,000 shares of ₹ 10 each)	₹ 20,00,000	11%
Preference Share Capital (50,000 shares of ₹ 10 each)	₹ 5,00,000	8%
Retained Earnings	₹ 10,00,000	11%
7.5% Debentures of ₹ 1,000 each	₹ 15,00,000	4.5%

Presently, the Debentures are being traded at 94%, Preference shares at par and the Equity shares at ₹ 13 per share. Find out the WACC based on book value weights and market value weights.

Solution :

1. **WACC based on Book value weights :**

Source	BV (₹)	Weights	C/C	Weighted C/C
Pref. Share Capital	5,00,000	.1	.080	.0080
Equity Share Capital	20,00,000	.4	.110	.0440
Retained Earnings	10,00,000	.2	.110	.0220
7.5% Debentures	15,00,000	.3	.045	.0135
	50,00,000	1.0		.0875

So, the WACC based on book value is 8.75%. The WACC can also be calculated as follows :

Source	BV (₹)	C/C	BV × C/C
Pref. Share Capital	5,00,000	.080	40,000
Equity Share Capital	20,00,000	.110	2,20,000

Source	BV (₹)	C/C	BV × C/C
Retained Earnings	10,00,000	.110	1,10,000
7.5% Debentures	15,00,000	.045	67,500
	50,00,000		4,37,500

$$\text{WACC} = \frac{4,37,500}{50,00,000} \times 100$$

$$= 8.75\%.$$

2. **WACC based on Market value weights :**

Source	MV(₹)	Weights	C/C	Weighted C/C
Pref. Share Capital	5,00,000	.111	.080	.0089
Equity Share Capital	17,33,333	.384	.110	.0422
Retained Earnings	8,66,667	.192	.110	.0211
7.5% Debentures	14,10,000	.313	.045	.0141
	45,10,000	1.00		.0863

So, the WACC based on market value is 8.63%. The WACC can also be calculated as follows :

Source	MV(₹)	C/C	MV × C/C
Pref. Share Capital	5,00,000	.080	40,000
Equity Share Capital	17,33,333	.110	1,90,667
Retained Earnings	8,66,667	.110	95,333
7.5% Debentures	14,10,000	.045	63,450
	45,10,000		3,89,450

$$\text{WACC} = \frac{3,89,450}{45,10,000} \times 100 = 8.63\%.$$

Note : (*i*) Calculation of Market values :

Total market value of Equity = 2,00,000 × 13 = ₹ 26,00,000

Out of ₹ 26,00,000, Equity share capital proportion is 26,00,000 (2/3) = ₹ 17,33,333 and the portion of retained earnings is ₹ 26,00,000 (1/3) = ₹ 8,66,667. (Because equity share capital and the retained earnings are in the ratio of 2:1 in the capital structure).

Total market value of Preference share capital is 50,000 × 10 = ₹ 5,00,000.

Total market value of 7.5% Debentures is ₹ 15,00,000 × .94 = ₹ 14,10,000.

(*ii*) In this question, the specific C/C are given. These specific C/C are used to find out WACC under both the BV weights and MV weights.

In the above discussion the WACC has been defined as the weighted average of the specific cost of capital of different sources of funds. Suppose, a firm has raised total funds by the issue of Equity share capital (E) and Debt (D). The WACC for the firm can be derived as follows :

$$\text{WACC} = [D/(D+E)] \times k_d + [E/(D+E)] \times k_e$$

where, k_d = After tax cost of Debt, and

k_e = Cost of Equity share capital

Consider, a firm which has raised 70% and 30% of its total funds by the issue of Equity shares and 12% Debentures. The required rate of return for equity capital is 16%. The WACC of the firm can be calculated as follows (assume that the tax rate is 30%).

$$k_d = .12(1 - .3) = .084$$

$$k_e = .16$$

$$\text{WACC} = [.3/(.3+.7)] \times .084 + [.7/(.3+.7)] \times .16$$

$$= 13.72\%.$$

The WACC is often denoted by k_o *i.e.*, overall cost of capital.

MARGINAL COST OF CAPITAL

In practice, the investment proposal may require funds to be raised from new internal/external sources and thus, increasing the total funds also. When this happens, the cost of capital of the additional funds is called the marginal cost of capital. If the additional financing uses more than one source, say a combination of debt and preference share capital, then the WACC of the new financing is called the Weighted Marginal Cost of Capital (WMCC). In the following discussion, the calculation of WMCC and its relation with the capital budgeting decisions process has been taken up.

The WMCC for any firm depends upon several factors and therefore the calculation of WMCC is a typical exercise. The following variables may affect the marginal cost of capital of a specific source and thereby may affect the WMCC as follows :

(*a*) The investors may perceive an increase in business risk of the firm.

(*b*) The financial risk of the firm may also change as a result of change in composition of the capital structure.

(*c*) The increase in business and financial risk may increase the marginal cost of capital and thus some of the proposals may become unviable.

Calculation of WMCC : The calculation of WMCC requires several steps to be taken and is subject to the following assumptions :

(*i*) The WMCC is calculated on the basis of market value weights because the new funds are to be raised at the market values.

(*ii*) The specific cost of capital can be accurately calculated.

The procedure for calculation of WMCC can be explained by starting from a simple situation and then gradually incorporating more and more variables as follows :

No External Financing for New Proposals : If a firm has sufficient retained earnings with it as required by the new proposal, then the firm may not raise any external finance. In such situations, the WMCC is equal to the specific cost of capital of retained earnings. For example, a firm has financed 70% of its total requirements by equity shareholders funds (C/C = 13%) and 30% by the issue of 12% bonds (after tax C/C = 6%). The WACC of the firm is

$$\text{WACC} = .06 \times .3 + .7 \times .13 = .109 \text{ or } 10.9\%.$$

However, the WMCC of the firm will be 13% as the new financing is provided only by the retained earnings.

External Financing with Same Cost of Capital and Same Proportions as Existing : If a firm raises new capital funds in

the same proportion as at present and at the same specific cost of capital as at present, then WMCC is equal to the WACC. Consider a firm having obtain 50%, 40% and 10% of the total funds by the issue of equity share capital, preference share capital and 10% debt. These sources have 10%, 9% and 5% as their specific cost of capital. Now, the WACC of the firm is

$$WACC = .5\ (.10) + .4(.09) + .1\ (.05) = .091 \text{ or } 9.1\%.$$

In order to finance an investment proposal of ₹ 10,00,000, the firm proposes to procure ₹ 5,00,000 by the issue of equity share capital, ₹ 4,00,000 by the issue of preference share capital and ₹ 1,00,000 by the issue of 10% debentures. It estimates that the cost of capital of additional funds will be same as at present. Since the proportion of different sources of new financing in the total new financing is the same as at present *i.e.*, 50% equity capital, 40% preference share capital and 10% by debentures, the WMCC can be calculated as follows :

$$WMCC = .5\ (.10) + .4(.09) + .1\ (.05) = .091 \text{ or } 9.1\%.$$

So, the WMCC is equal to the WACC.

Different Cost of Capital with Changed Proportions : It is quite possible that the specific costs of capital of different sources may be affected by the amount of funds raised and the proportion of a particular source may also change as a result of new funds. Consequently, the WMCC may also change and vary differently. For example, following is the capital structure of firm.

Source	Amount (₹)	Weight	Specific C/C
Equity share capital	25,00,000	.50	11%
Retained Earnings	12,50,000	.25	11%
11% Debentures	12,50,000	.25	5.5%

The WACC of the firm may be calculated as follows :

$$WACC = .5\ (.11) + .25(.11) + .25\ (.055) = .096 \text{ or } 9.6\%.$$

It may be noted that the rate of interest on debentures is 11% but the specific cost of debt is given as 5.5%, therefore, the tax rate is 50%.

Suppose, the firm has an investment proposal of ₹ 10,00,000 and expect to generate retained earnings of ₹ 2,00,000 from the current operations. The remaining funds are raised by the issue of Equity share capital (₹ 6,00,000 at 12%) and 12% Bonds (₹ 2,00,000). The WMCC of the firm can now be ascertained as follows :

$$WMCC = .6\ (.12) + .2(.11) + .2\ (.06) = .106 \text{ or } 10.6\%.$$

The WACC of the firm can now be calculated as follows :

Source	Amount (₹)	Weight	C/C	Weight × C/C
Equity share capital	25,00,000	.417	.11	.0458
Equity share capital	6,00,000	.100	.12	.0120
Retained Earnings	12,50,000	.208	.11	.0228
Retained Earnings	2,00,000	.033	.11	.0036
11% Debentures	12,50,000	.209	.055	.0115
12% Debentures	2,00,000	.033	.060	.0020
	60,00,000	1.000		.0977

The WACC of the firm is .0977 or 9.77%. So, the WACC has increased from 9.6% to 9.77% as a result of WMCC of 10.6% (which was higher than the then WACC). So, the WMCC has lifted the WACC.

Breaks in Specific Cost of capital : The specific costs of capital may also be affected by the amount of finance the firm wants to raise. As the amount of financing increases, the costs of various sources may also increase. These increasing costs are attributable to the fact that the investors would require greater returns to be compensated for the increased risk resulting from the larger volumes of new financing. Consequently, the WMCC tends to rise as the firm seeks more and more funds.

Breaks in specific cost of capital occur as a function of the amount of funds being raised. The levels at which the specific cost of capital of a particular source increases are called the breaking points. The firm must find out at what levels of total new financing, the breaks in specific cost of capital and consequently breaks in WMCC occur and should also measure the WMCC at each of such breaks. The following procedure can be used to measure the WMCC when the specific cost of capital depends on the amount raised :

1. Establish the percentage composition of new financing.
2. Prepare a list for each such source of financing giving the amount of funds that can be obtained and the specific cost of capital associated with each amount to be raised. The specific cost of capital can be determined through an analysis of the current market conditions.
3. On the basis of the percentage composition of the total new financing (Step 1), estimate the breaking points in the WMCC. The break points identify the levels of the total new financing at which the WMCC increases. The breaking points for a particular source can be calculated as follows :

$$BP_i = \frac{TF_i}{W_i} \qquad (5.16)$$

where, BP_i = Breaking points for source i

TF_i = Maximum financing available from source i at breaking point.

W_i = Weight of the source i

4. After determining the breaking points for each source, the WMCC can be determined at each break point over the range of total financing.

Example 5.7

A firm wishes to raise funds up to ₹ 10,00,000 and finds that its WMCC depends upon the amount of funds raised. The firm has set pattern of financing *i.e.*, 75% shareholders funds and 25% debt. The shareholders funds may be taken as consisting of retained earnings and capital. The following cost for each source have been estimated at different levels of financing from that source.

Source	Amount (₹)	Cost
Shareholders (SH) Funds	Upto ₹ 1,50,000	12%
	1,50,000–6,00,000	14%

Source	Amount (₹)	Cost
Bonds (Rate of Interest)	6,00,000–9,00,000	17%
	Upto 1,00,000	7.15%
	1,00,000–2,00,000	8.57%
	2,00,000–3,00,000	11.43%

Find out the WMCC at different breaking points given that (*i*) the tax rate applicable to the firm is 30% and (*ii*) the retained earnings of ₹ 1,50,000 will be provided by the current earnings at specific cost of capital of 12%. Additional needed shareholder funds will have to be raised by the issue of share capital.

Solution :

After-tax specific cost of debt funds are :

7.15 (1–.3) = 5%

8.57 (1–.3) = 6%, and

11.43 (1–.3) = 8%

Estimation of WMCC breaking points :

Step I : Percentage composition of shareholders funds 75%

Percentage composition of bonds 25%

Step II : Find out the breaking points at different levels of each source as follows :

Source	Amt. (₹)	Weight	Break Point (₹)	Total Funds (₹)	Specific C/C
SH Funds	1,50,000	.75	2,00,000	Up to 2,00,000	.12
	6,00,000	.75	8,00,000	2,00,000–8,00,000	.14
	9,00,000	.75	12,00,000	8,00,000–12,00,000	.17
Bonds	1,00,000	.25	4,00,000	Upto 4,00,000	.05
	2,00,000	.25	8,00,000	4,00,000–+8,00,000	.06
	3,00,000	.25	12,00,000	8,00,000–12,00,000	.08

Step III : Calculation of WMCC for each range of financing.

Range (₹)	Source	Weight	C/C	Weighted C/C	WMCC
Upto 2,00,000	SH funds	.75	.12	.0900	
	Debt	.25	.05	.0125	.1025
2,00,000–4,00,000	SH funds	.75	.14	.1050	
	Debt	.25	.05	.0125	.1175
4,00,000–8,00,000	SH funds	.75	.14	.1050	
	Debt	.25	.06	.0150	.1200
8,00,000–12,00,000	SH funds	.75	.17	.1275	
	Debt	.25	.08	.0200	.1475

Therefore, the WMCC at different levels of financing are :

Levels of Financing	WMCC
Upto ₹ 2,00,000	10.25%
2,00,000–4,00,000	11.75%
4,00,000–8,00,000	12.00%
8,00,000–12,00,000	14.75%

The WMCC at different levels can be plotted on a graph also as given in Figure 5.1.

Figure 5.1 shows the WMCC as a function of total new financing. The straight line segments are the WMCC values for a given range of total new financing. It may be noted that the breaks in WMCC need not necessarily occur at equal intervals of new financing.

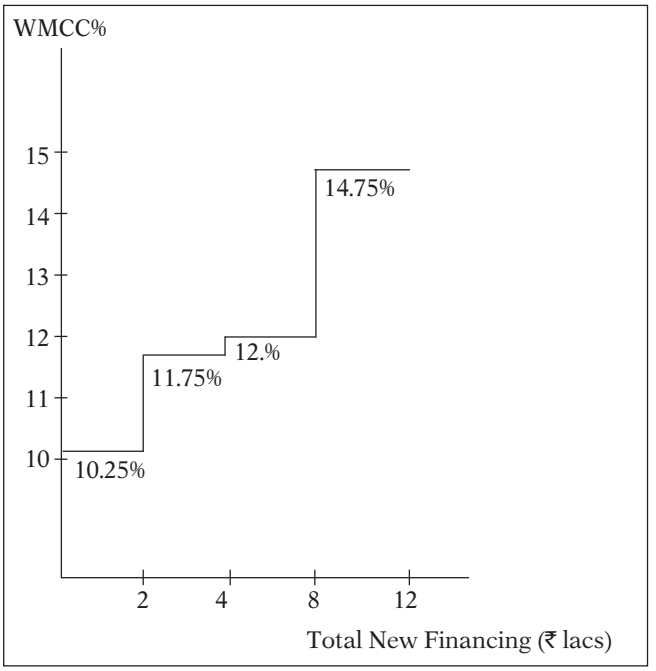

FIGURE 5.1 : WMCC AS A FUNCTION OF TOTAL NEW FINANCING.

Example 5.8

A firm finds break points in its WMCC at the following levels of new financing :

Levels of Financing	WMCC
₹ 12,00,000	10%
18,00,000	12%
28,00,000	16%
36,00,000	21%

Analyze the above and set the acceptance criterion for the selection of proposals.

Solution :

The information given in respect of the firm denotes that additional funds can be procured by the firm only at increasing WMCC. So, the firm has to decide as to which investment proposal be accepted and which are to be rejected.

In the first instance, the firm should evaluate the proposals which require funds up to ₹ 12,00,000 only at the discount rate of 10%. Projects having positive NPV may be accepted. Then, it should proceed to evaluate those investment proposals which require funds upto Rs, 18,00,000 at discount rate of 12%. It repeat the process for investment proposals requiring funds upto ₹ 28,00,000 at discount rate of 16% and so on. Suppose the firm gets the following values of NPV at different financing constraints and different discount rates :

Levels of Financing	NPV
₹ 12,00,000	₹ 5,00,000
18,00,000	9,00,000
28,00,000	15,00,000
36,00,000	13,00,000

So, the highest positive NPV of ₹ 15,00,000 occurs when the firm accepts proposal requiring funds of ₹ 28,00,000 and discounted at 16%. In view of the objective of maximization of shareholders wealth, the optimal capital budgeting consists of the investment requiring funds upto ₹ 28,00,000 and returning a NPV of ₹ 15,00,000. The funds for these proposals may be raised at a specific cost of capital of 16%.

POINTS TO REMEMBER

- The cost of capital is the minimum required rate of return which firm must earn on its funds in order to satisfy the expectation of its supplier of funds.
- If the return from capital budgeting proposals is more than the cost of capital, then the difference will be added to the wealth of the shareholders.
- The concept of cost of capital has a role to play in capital budgeting as well as in finalizing the capital structure for the firm.
- The cost of capital depends upon the risk free interest rate and the risk premium which depends upon the risk of the investment and the risk of the firm.
- The cost of capital may be defined in terms of (1) Explicit cost, which the firm pays to the supplier and (2) Implicit cost *i.e.* the opportunity cost of the funds to the firm.
- The cost of capital is calculated in after tax terms.
- Different sources of funds available to the firm may be grouped into Debt, Pref. share capital, Equity share capital and Retained Earnings and these sources have their specific cost of capital.
- The cost of Debt and cost of Pref. share capital basically depend upon the rate of interest/dividend and the issue/redemption values and are defined as k_d = Rate of Interest (1–t) and k_p = Rate of Dividend.
- The cost of equity share capital, k_e, is defined as $k_e = D/P_0$, or $k_e = (D_1/P_1) + g$. The cost of retained earning is lower than cost of equity as the former does not have any flotation cost.
- The overall cost of capital of the firm may be ascertained as the weighted average of these specific cost of capital.
- The Weighted Average Cost of Capital. WACC. may be ascertained by applying book value weights or market value weights of different sources of funds. The WACC is denoted as k_0.

GRADED ILLUSTRATIONS

Illustration 5.1

Assuming that the firm pays tax at a 30% rate, compute the after tax cost of capital in the following cases :

(*i*) A 14.5% preference shares sold at par.

(*ii*) A perpetual bond sold at par, coupon rate being 13.5%.

(*iii*) A ten year 8% ₹ 1,000 per bond sold at ₹ 950.

(*iv*) A common share selling at a market price of ₹ 120 and paying a current dividend of ₹ 9 per share which is expected to grow at a rate of 8%.

(*v*) 14% Preference Shares of ₹100 each, issued at 5% premium, redeemable at par after 6 years. Flotation cost is ₹ 8 and Dividend Distribution Tax is 15%. Use both method.

(*vi*) 12 % Debentures of face value of ₹1000 each redeemable at par after 5 years, flotation cost being 5%. Use both methods given the tax rate @30%.

Solution :

(*i*) The Cost of Preference Shares (after tax) is 14.5%.

(*ii*) The Cost of debt is :

$k_d = 13.5\% (1 - .3)$

$= 9.45\%$

(*iii*) Approximate k_d is $= \dfrac{\text{Int.}(1-t)+(RV-B_0)/N}{(RV-B_0)\div 2}$

where, Int. = Annual Interest
t = Tax rate
RV = Redemption Value of the bond
B_0 = Net Issue price of the bond
N = Life of the bond

$$k_d = \frac{80(1-.3)+(1000-950)\div 10}{(1000-950)\div 2} = \frac{56+5}{975} = 6.26\%$$

(*iv*) $P_0 = 120$
$D_0 = 9$
$g = 8\%$
So, $D_1 = 9\,(1+.08) = 9.72$

Now $k_e = \dfrac{D_1}{P_0} + g = \dfrac{9.72}{120} + .08 = .161$ or 16.1%

(*v*) Rate of Dividend = 14%
Net Proceeds = ₹105–8=₹97
Dividend Per Share + Tax = ₹ 14+2.10 = ₹16.10

(a) $k_p = \dfrac{PD+(PV-P_0)/N}{(RV+P_0)/2}\times 100$

$= \dfrac{₹16.10+(100-97)/6}{(100+97)/2}\times 100 = 16.85\%$

(b) ₹97 $= ₹16.10\times PVAF_{(kp,\,6)} + ₹100\times PVF_{(kp,\,6)}$
@ 16% $= ₹16.10\times 3.685 + ₹100\times .410$
$= ₹100.33$
@17% $= 16.10\times 3.589 + ₹100\times .390$
$= ₹96.79$

Interpolation between 16% and 17%:

$= 16\% + \dfrac{₹100.33-97.00}{₹100.33-96.79}\times 1$

$= 16.94\%$

(*vi*) Rate of Interest = 12%
Face value = ₹1000
Interest per year= ₹ 120

(a) $k_d = \dfrac{\text{Int}\,(1-t)+(RV-B_0)/N}{(RV+B_0)/2}\times 100$

$= \dfrac{₹120(1-.3)+(1000-950)/5}{(₹1,000+₹950)/2}\times 100$

$= \dfrac{₹84+₹10}{₹975}\times 100 = 9.64\%$

(b) @ 9% $= ₹120\,(1-.3)\times PVAF_{(9,\,5)} + ₹1,000\times PVF_{(9,\,5)}$
$= ₹84\times 3.890 + ₹1,000\times .650$
$= ₹976.76$
@ 10% $= ₹120\,(1-.3)\times PVAF_{(10,\,5)} + ₹1,000\times PVF_{(10,\,5)}$
$= ₹84\times 3.791 + ₹1,000\times .621$
$= ₹939.44$

Interpretation for ₹950 between 9% and 10%:

$= 9\% + \dfrac{₹976.76-₹950}{₹976.76-₹939.44}\times 1$

$= 9.72\%$

Illustration 5.2

Satija company has the following capital structure on 1 July 2015 :

Equity Shares (4,00,000)	₹ 80,00,000
10% Preference Shares	20,00,000
10% Debentures	60,00,000
	1,60,00,000

The share of a company currently sells for ₹ 25. It is expected that the company will pay a dividend of ₹ 2 per share which will grow at 7 per cent forever. Assume a 30 per cent tax rate.

You are required to compute a weighted average cost of capital on existing capital structure.

Solution :

Cost of Debt (after tax)

$k_d = 10\,(1-.3) = 7\%$

Cost of Equity share capital

$$k_e = \frac{D_1}{P_0} + g = \frac{₹\,2}{₹\,25} + .07 = .08 + .07 = 15\%$$

Calculation of WACC :

Source	Amount	Weight	Specific C/C	W×C/C
Equity Share Capital	₹ 80,00,000	.500	.15	.07500
10% Pref. Share Capital	₹ 20,00,000	.125	.10	.01250
10% Debentures	₹ 60,00,000	.375	.07	.02625
	1,60,00,000			.11375

The WACC is 11.375%.

Illustration 5.3

Your company's share is quoted in the market at ₹ 20 currently. The company has paid dividend of ₹ 1 per share and the investor's market expects a growth rate of 5 per cent per year. You are required to compute :

(*i*) The company's Equity Cost of Capital.

(*ii*) If the company's cost of capital is 8 per cent and the anticipated growth rate is 5 per cent per annum, calculate market price if the dividend of ₹ 1 is to be paid at the end of one year.

Solution :

(*i*) The equity cost of capital, k_e is :

$$k_e = \frac{D_1}{P_0} + g = \frac{1.05}{20} + .05 = 10.25\%$$

(*ii*) If $k_e = 8\%$, $g = 5\%$ and $D_1 = 1$

$$P_0 = \frac{D_1}{k_e - g} = \frac{1}{.08 - .05} = 33.33$$

So, the market price of the share at present would be ₹ 33.33.

Illustration 5.4

Equity shares (F.V ₹ 10 each) of SRCC Ltd. are being quoted at PE of 7.5 times. The retained earnings of the company being ₹6 at 40%.

(*i*) Find out the cost of equity, k_e, if the growth rate of the firm is 7%.

(*ii*) Find out the indicated market price of the shares, given that the k_e remains as above and growth rate increases to 9%.

(*iii*) If k_e of the firm is 15% and growth rate being 10%, then what is the indicated market price of the equity share.

Solution:

Retained earnings	₹6
Retention Ratio	40%
So, Earnings Per Share (₹6/.40)	₹15
Price Earning Ratio	7.5 times
Dividend Per share, D_0 = (₹15–₹6)	₹9
(*i*) k_e if g = 7%, $(D_1/P_0)+g$)	(9.63/112.50)+.07=15.56%
(*ii*) P_0 if k_e =15.56% and g = 9%	(9.81/(.1556–.09))=₹149.54
(*iii*) P_0 if k_e = 15% and g=10%	(9.90/(.15–.10))=₹198

Illustration 5.5

Shares of XYZ Ltd. are currently selling at ₹170 each. The company has been regularly paying dividends for last several years as follows:

Year	Amount
1	₹12.00
2	12.72
3	13.48
4	14.29
5	15.15
6	16.07

Find out the growth rate of the company, given that the company follows a policy of fixed DP Ratio. Also find out the cost of equity of the company.

Solution:

In this case, Dividend for year 1, ₹12.00 has increased to ₹16.07 for the year 6. So, the cumulative growth rate for 5 years is:

Cumulative Growth Rate=D6/D1=₹16.07/₹12.00=1.339

In the CVF Table, the value nearest to 1.339 for 5 years row is found as 1.340 in 6% column. So, the annual growth rate can be taken as 6%.

$$\text{Cost of Equity, } k_e = \frac{D_1}{P_0} + g$$

$$= \frac{₹16.07(1+.06)}{₹170} + .06 = 16.02\%$$

Illustration 5.6

The following figures are taken from the current balance sheet of Delaware & Co.

Capital	₹ 8,00,000
Share Premium	2,00,000
Reserves	6,00,000
Shareholder's funds	16,00,000
12% Perpetual debentures	4,00,000

An annual ordinary dividend of ₹ 2 per share has just been paid. In the past, ordinary dividends have grown at a rate of 10 per cent per annum and this rate of growth is expected to continue. Annual interest has recently been paid on the debentures. The ordinary shares are currently quoted at ₹ 27.50 and the debentures at 80 per cent Ignore taxation.

You are required to estimate the weighted average cost of capital (based on market values) for Delaware & Co.

[B.Com.(H), D.U., 2014]

Solution :

In order to calculate the WACC, the specific cost of equity capital and debt are to be calculated as follows :

$$k_e = \frac{D_1}{P_0} + g = \frac{₹\ 2 \times 1.10}{₹\ 27.50} + .10 = 18\%$$

The market value of equity is 80,000 × ₹ 27.50
= ₹ 22,00,000

$$k_d = \frac{I}{B_0} = \frac{₹\ 12}{₹\ 80} = 15\%$$

The market value of debt is 4,00,000 × .80 = ₹ 3,20,000.

Now, the WACC is (22,00,000/25,20,000) × .18 + (3,20,000/25,20,000) × .15 = .176 = 17.6%

Note : In this case, the dividend of ₹ 2 has just been paid. So, D_0 = ₹ 2 and the D_1, *i.e.*, dividend expected after one year from now will be $D_0 \times (1 + g)$ = ₹ 2 × 1.10.

Illustration 5.7

The following information has been extracted from the balance sheet of Fashions Ltd.

	₹ in Lacs
Equity Share Capital	400
12% Debentures	400
18% Term loan	1,200
	2,000

(*a*) Determine the weighted average cost of capital of the company. It had been paying dividends at a consistent rate of 20% per annum. Shares and Debentures are being traded at par. Tax rate is 30%.

(*b*) What difference will it make if the current price of ₹ 100 share is ₹ 160 ?

Solution :

In the given case, the cost of Debt is : Rate of interest (1 – t)

12% Debenture : 12 × 0.70 = 8.4%

18% Term Loan : 18 × 0.70 = 12.6%

The cost of capital after tax benefit (as per premise – a):

Sources	Cost	Proportion	Weighted Cost
Equity	20%	4/20	4.00
12% Debenture	8.4%	4/20	1.68
18% Term loan	12.6%	12/20	7.56
	Weighted average cost (%)		13.24

The cost of capital after tax benefit (as per premise-b) :

In this, the cost of debt would be same as above, but the cost of equity is 20 ÷ 160 = 12.5%. Now, WACC is as follows :

Sources	Cost	Proportion	Weighted Cost
Equity	12.5%	4/20	2.50
12% debentures	8.4%	4/20	1.68
18% Term Loan	12.6%	12/20	7.56
Weighted average cost (%)			11.74

Illustration 5.8

The following information is available from the Balance Sheet of a Company :

Equity Share Capital–20,000 shares of ₹ 10 each	₹ 2,00,000
Reserves and Surplus	₹ 1,30,000
8% Debentures	₹ 1,70,000

The rate of tax for the company is 30%. Current level of Equity Dividend is 12%. Calculate the weighted average cost of capital using the above figures.

Solution :

Capital Structure	Amount	Proportion of Capital Structure
Equity Share Capital	₹ 2,00,000	40%
Reserves and Surplus	1,30,000	26%
Net Worth	3,30,000	66%
8% Debentures	1,70,000	34%
	5,00,000	100%

Capital Structure	Amount ₹	Proportion (weight)	After tax Cost	Weighted Cost
Equity	2,00,000	40%	12%	12% × 40% = 4.80%
Reserves and Surplus	1,30,000	26%	12%	12% × 26% = 3.12%
8% Debentures	1,70,000	34%	5.6%	5.6% × 34% = 1.90%
Total	5,00,000	100%		9.82%

As the current market price of equity share is not given, the cost of capital of equity share has been taken with reference to the rate of dividend and the face value of the share. So, $k_e = 12/100 = 12\%$. The opportunity cost of retained earnings is the dividends foregone by shareholders. Therefore, the firm must earn the same rate of return on retained earnings as on the Equity Share Capital. Thus, the minimum cost of retained earnings is the cost of equity capital *i.e.*, $k_r = k_e$.

Illustration 5.9

In considering the most desirable capital structure for a company, the following estimates of the cost of debt capital (after tax) have been made at various levels of debt-equity mix :

Debt as Percentage of Total Capital Employed	Cost of Debt %	Cost of Equity %.
0	7.0	15.0
10	7.0	15.0
20	7.0	15.5
30	7.5	16.0
40	8.0	17.0
50	8.5	19.0
60	9.5	20.0

You are required to find out the weighted average cost of capital of the firm for different proportions of debt.

Solution :

The optimal capital structure may be ascertained in terms of the cost of capital of the firm as that level at which the WACC is lowest. The WACC of the firm may be ascertained as follows :

Debt%	k_d%	C/C × Debt %	Equity %	k_e%	C/C × Equity %	WACC%
0	7.0	—	100	15.0	15.0	15.00
10	7.0	.70	90	15.0	13.5	14.20
20	7.0	1.40	80	15.5	12.4	13.80
30	7.5	2.25	70	16.0	11.2	13.45
40	8.0	3.20	60	17.0	10.2	13.40
50	8.5	4.25	50	19.0	9.5	13.75
60	9.5	5.70	40	20.0	8.0	13.70

Out of different debt proportions, the firm has the minimum WACC when the debt proportion is 40%. Therefore, the optimal capital structure for the firm is consisting of 40% debt and 60% equity and its WACC would be 13.4%.

Illustration 5.10

A company with net operating income of ₹ 3,00,000 is attempting to evaluate a number of possible capital structures, given below. Which of the capital structure will you recommend and why?

Capital Structure	Debt in Capital Structure	Cost of Debt(%)	Cost of Equity(%)
1	₹ 1,00,000	10	12.0
2	₹ 2,00,000	10	12.0
3	₹ 3,00,000	10	12.0
4	₹ 4,00,000	10	12.5
5	₹ 5,00,000	11	13.5
6	₹ 6,00,000	12	15.0
7	₹ 7,00,000	14	18.0

[B.Com.(H), D.U., 2011]

Solution :

A capital structure can be selected on the basis of value of the firm as follows:

Capital Structure	EBIT (₹)	Interest	NP	k_e (%)	V_E (₹)	V_D (₹)	Total Value
1	3,00,000	10,000	2,90,000	12.0	24,16,667	1,00,000	25,16,667
2	3,00,000	20,000	2,80,000	12.0	23,33,333	2,00,000	25,33,333
3	3,00,000	30,000	2,70,000	12.0	22,50,000	3,00,000	25,50,000
4	3,00,000	40,000	2,60,000	12.5	20,80,000	4,00,000	24,80,000
5	3,00,000	55,000	2,45,000	13.5	18,14,815	5,00,000	23,14,815
6	3,00,000	72,000	2,28,000	15.0	15,20,000	6,00,000	21,20,000
7	3,00,000	98,000	2,02,000	18.0	11,22,222	7,00,000	18,22,222

The value of the firm is highest (₹ 25,50,000) for capital structure No. 3 (10% Debt of ₹ 3,00,000). So, capital structure No. 3 be adopted by the firm.

Illustration 5.11

PQR & Co. has the following capital structure as on Dec. 31.

Equity Share Capital (5000 shares of ₹ 100 each)	₹ 5,00,000
9% Preference Shares	₹ 2,00,000
10% Debentures	₹ 3,00,000

The equity shares of the company are quoted at ₹ 102 and the company is expected to declare a dividend of ₹ 9 per share for the next year. The company has registered a dividend growth rate of 5% which is expected to be maintained.

(*i*) Assuming the tax rate applicable to the company at 30%, calculate the weighted average cost of capital, and

(*ii*) Assuming that the company can raise additional term loan at 12% for ₹ 5,00,000 to finance its expansion, calculate the revised WACC. The company's expectation is that the business risk associated with new financing may bring down the market price from ₹ 102 to ₹ 96 per share.

Solution :

The present WACC may be calculated as follows :

Cost of equity capital = $k_e = (D_1/P_0) + g$

$= (9/102) + .05 = .138$ or 13.8%

Source	Weight	C/C	Weighted C/C
Equity share capital	.5	13.8%	6.9%
9% Preference share capital	.2	9.0%	1.8%
10% Debentures	.3	7.0%	2.1%
WACC	1.0		10.8%

If the company decides to raise ₹ 5,00,000 by the issue of 12% loan and the market price of the share is expected to go down to ₹ 96, then the WACC may be calculated as follows:

Cost of equity capital, $k_E = (D_1/P_0) + g$

$= (9/96) + .05 = .144$ or 14.4%

Source	Weight	C/C	Weighted C/C
Equity share capital	.33	14.4%	4.75%
Preference share capital	.14	9.0%	1.26%
10% Debentures	.20	7.0%	1.40%
12% Loan	.33	8.4%	2.77%
WACC	1.00		10.18%

So, the new WACC of the company would be 10.18%.

Illustration 5.12

International Foods Limited has the following capital structure :

	Book Value	Market Value
Equity Capital (25,000 shares of ₹ 10 each)	₹ 2,50,000	₹ 4,50,000
13% Preference Capital (500 shares of ₹ 100 each)	50,000	45,000
Reserves and Surplus	1,50,000	—
12% Debentures (1500 debentures of ₹ 100 each)	1,50,000	1,45,000
	6,00,000	6,40,000

The expected dividend per share is ₹ 1.40 and the dividend per share is expected to grow at a rate of 8 per cent forever. Preference shares are redeemable after 5 years at par whereas debentures are redeemable after 6 years at par. The tax rate for the company is 30 per cent. You are required to compute the weighted average cost of capital for the existing capital structure using market value as weights.

Solution :

Calculation of Specific Cost of Capital:

Equity Share Capital:

$$k_e = \frac{D_1}{P_0} + g = \frac{1.40}{18} + .08 = 15.77\%$$

The market price of the share, P_0 has been taken at ₹ 4,50,000 ÷ 25,000 = ₹ 18 per share.

Preference Share Capital:

As the Preference Shares are redeemable after 5 years, the cost of capital may be found as follows:

$$k_p = \frac{PD + (RV - MP) \div N}{(RV + MP) \div 2}$$

$$= \frac{13 + (100 - 90) \div 5}{(100 + 90) \div 2} = 15.8\%$$

The market price of preference share is ₹ 45,000 ÷ 500 = ₹ 90.

14% Debentures :

As the debentures are redeemed after 6 years, the cost of capital may be found as follows:

$$k_d = \frac{\text{Int. } (1 - t) + (RV - MP) \div N}{(RV + MP) \div 2}$$

$$= \frac{12\ (1 - .3) + (100 - 96.67) \div 6}{(100 + 96.67) \div 2} = 9.10\%$$

The market price of the debenture is ₹ 1,45,000 ÷ 1,500 = 96.67.

The Weighted Average Cost of Capital (based on market value weights) can now be calculated as follows :-

CALCULATION OF WACC (MARKET VALUE WEIGHTS)

Source	Market Value	Weight	C/C	W × C/C
Equity Share Capital	₹ 281,250	.439	.1577	.0692
Pref. Share Capital	45,000	.071	.1580	.0112
Reserves & Surplus	1,68,750	.263	.1577	.0415
14% Debentures	1,45,000	.227	.0910	.0206
	6,40,000	1,000		.1425

So, the WACC of the firm is 14.25%.

The total market value of equity *i.e.* ₹ 4,50,000 has been bifurcated into Equity share capital and Reserves in the ratio of 2,50,000 : 1,50,000.

Illustration 5.13

A Limited has the following capital structure:

Equity share capital (2,00,000 shares)	₹ 40,00,000
6% Preference shares	10,00,000
8% Debentures	30,00,000
	80,00,000

The market price of the company's equity share is ₹ 20. It is expected that company will pay a dividend of ₹ 2 per share at the end of current year, which will grow at 7 per cent for ever. The tax rate is 30 per cent. You are required to compute the following :

(*a*) A weighted average cost of capital based on existing capital structure.

(*b*) the new weighted average cost of capital if the company raises an additional ₹ 20,00,000 debt by issuing 10 per cent debentures. This would result in increasing the expected dividend to ₹ 3 and leave the growth rate unchanged but the price of share will fall to ₹ 15 per share.

(*c*) The cost of capital if in (*b*) above, growth rate increases to 10 per cent. *[B.Com.(H.), D.U. 2013]*

Solution :

(*a*) **The cost of Equity Capital is:**

$$k_e = \frac{D_1}{P_o} + g = \frac{₹\ 2}{₹\ 20} + .07 = 0.1 + .07 = .17 \text{ or } 17\%.$$

The cost of 8% debentures, after tax is 8 (1 – .3) = 5.6%.

STATEMENT SHOWING WEIGHTED COST OF CAPITAL

	Existing Amt.	After-tax Cost	Weights	Weighted Cost
Equity share capital	₹ 40,00,000	.170	.500	.0850
Preference share capital	10,00,000	.060	.125	.0075
Debentures	30,00,000	.056	.375	.0210
				.1135

So, Weighted Average cost of capital (k_0) is 11.35%.

(*b*) $k_e = \frac{D_1}{P_0} + g = \frac{₹\ 3}{₹\ 15} + .07 = .20 + .07 = .27$ or 27%.

The cost of capital of new debenture (after tax) is :

10% (1 – .3) = 7%.

STATEMENT SHOWING WEIGHTED AVERAGE COST OF CAPITAL

	Amount	After-tax Cost	Weights	Weighted Cost
Equity share capital	₹ 40,00,000	.270	.40	.108
6% Preference share capital	10,00,000	.060	.10	.006
8% Debentures	30,00,000	.056	.30	.017
10% Debentures	20,00,000	.070	.20	.014
				.145

So, Weighted Average cost of capital (k_0) is 14.50%.

(*c*) $k_e = \frac{D_1}{P_0} + g = \frac{₹\ 3}{₹\ 15} + .10 = .20 + .10 = .30$ or 30%.

STATEMENT SHOWING WEIGHTED AVERAGE COST OF CAPITAL

	Amount	After-tax Cost	Weights	Weighted Cost
Equity share capital	₹ 40,00,000	.300	.40	.120
6% Preference share capital	10,00,000	.060	.10	.006
8% Debentures	30,00,000	.056	.30	.017
10% Debentures	20,00,000	.070	.20	.014
				.157

So, Weighted Average cost of capital (k_0) is 15.70%.

Illustration 5.14

An electric equipment manufacturing company wishes to determine the weighted average cost of capital for evaluating capital budgeting projects. You have been supplied with the following information :

BALANCE SHEET

Liabilities	Amount	Assets	Amount
Equity share capital	₹ 12,00,000	Fixed Assets	₹ 25,00,000
Pref. share capital	4,50,000	Current Assets	15,00,000
Retained Earnings	4,50,000		
Debentures	9,00,000		
Current Liabilities	10,00,000		
	40,00,000		40,00,000

Additional Information :

(*i*) 20 years 14% Debentures of ₹ 2,500 face value, redeemable at 5% premium can be sold at par. 2% Flotation costs.

(*ii*) 15% Preference shares : Sale price ₹ 100 per share, 2% Flotation costs.

(*iii*) Equity shares : Sale price ₹ 115 per share, Flotation costs, ₹ 5 per share.

The corporate tax rate is 35% and the expected growth in equity dividend is 8% per year. The expected dividend at the end of the current financial year is ₹ 11 per share. Assume that the company is satisfied with its present capital structure and intends to maintain it.

Solution:

Specific Costs of Capital:

$$k_d = \frac{I(1-t) + (RV - B_0)/N}{(RV + B_0)/2}$$

$$= \frac{₹\,350\,(0.65) + (2{,}625 - 2{,}450)/20}{(₹\,2{,}625 + 2{,}450)/2}$$

$$= \frac{₹\,227.50 + 8.75}{₹\,2{,}537.50} = 9.31\%$$

$$k_p = \frac{₹\,15}{₹\,100 - 2} = 15.30\%$$

$$k_e = \frac{D_1}{P_0(1-f)} + g = \frac{₹\,11}{₹\,110} + 8\% = 18\%$$

Sources	Weights	Specific Cost	Weighted Cost
Equity funds	0.55	0.1800	0.0990
15% Preference shares	0.15	0.1530	0.0229
14% Debentures	0.30	0.0931	0.0279
			0.1498

So, Weighted average cost of capital, (k_0), is 14.98%.

Illustration 5.15

The latest Balance Sheet of D Ltd. is given below :

	(₹ '000)
Ordinary shares (50,000 shares)	500
Share Premium	100
Retained Profits	600
	1,200
8% Preference shares	400
13% Perpetual debt (Face value ₹ 100 each)	600
	2,200

The ordinary shares are currently priced at ₹ 39 ex-dividend each and ₹ 25 preference share is priced at ₹ 18 cum-dividend. The debentures are selling at 110 per cent ex-interest and tax is paid by D Ltd. at 30 per cent. D Ltd.'s cost of equity has been estimated at 19 per cent.

Calculate the weighted average cost of capital (based on market value) WACC of D Ltd.

Solution :

The WACC can be calculated on the basis of specific cost of capital of the firm as follows :

Cost of Equity capital = k_e = 19% (given)

Cost of Preference share:

$$k_p = \frac{D}{P_0} = \frac{₹\,2}{₹\,18 - 2} = 12.5\%$$

Cost of Perpetual debt:

$$k_d = \frac{1(1-t)}{B_0} = \frac{₹\,13\,(1 - .3)}{₹\,110} = 8.27\%$$

The total market value of different sources is as follows :

Source		Market Value	Weight
Equity capital	50,000 × 39	₹ 19,50,000	.68
8% Preference share	16,000 × 16	₹ 2,56,000	.09
13% Perpetual debt	6,000 × 110	₹ 6,60,000	.23
		28,66,000	1.00

Calculation of WACC:

Source	MV Weights	C/C%	W × C/C %
Equity share capital	.68	19.0	12.92
Preference share	.09	12.5	1.12
Perpetual debt	.23	8.27	1.90
	1.0		15.94

Therefore, the WACC of the firm is 15.94%.

Illustration 5.16

Determine the weighted average cost of capital using (*i*) book value weights; and (*ii*) market value weights based on the following information :

Book value structure

Debentures (₹ 100 per debenture)	₹ 8,00,000
Preference shares (₹ 100 per share)	2,00,000
Equity shares (₹ 10 per share)	10.00.000
	20,00,000

Recent market prices of all these securities are: Debentures: ₹ 110 per Debenture; Preference shares: ₹ 120 per share and Equity shares: ₹ 22 per share.

External financing opportunities are :

(*i*) ₹ 100 per Debenture redeemable at par, 10 year maturity, 13% coupon rate, 4% flotation cost and sale price ₹ 100;

(*ii*) ₹ 100 per Preference Share redeemable at par, 10 year maturity, 14% dividend rate, 5% flotation cost and sale price ₹ 100; and

(*iii*) Equity shares : ₹ 2 per share flotation costs and sale price ₹ 22.

Dividend expected on equity shares at the end of the year is ₹ 2 per share; anticipated growth rate in dividends is 7%. Company pays all its earnings in the form of dividends. Corporate tax rate is 30%. *[B.Com.(H.), D.U., 2018]*

Solution :

Determination of Specific Costs :

Cost of Debts :

$$k_d = \frac{\text{Int. } (1-t)(RV - B_0)/N}{(RV + B_0) \div 2} = \frac{13(.7) + 4 \div 10)}{(100 + 96) \div 2} = \frac{69}{98} \times 10 = 9.69$$

Cost of Preference Shares :

$$k_p = \frac{PD + (RV - P_0)/N}{(RV + P_0) \div 2} = \frac{14 + (5 \div 10)}{(100 + 95) \div 2} = \frac{14.50}{97.50} \times 100 = 14.9\%$$

Cost of Equity Shares:

$$k_e = \frac{D_1}{P_0(1-f)} + g = \frac{2}{20} + 7\% = 10\% + 7\% = 17\%$$

k_0 based on Book Value Weights :

Source of Capital	Book Value	Special Cost	Total Cost
Debentures	₹ 8,00,000	9.69%	77,520
Preference Shares	2,00,000	14.90%	29,800
Equity Shares	10,00,000	17.00%	1,70,000
	20,00,000		2,77,320

$$\text{So, } k_0 = \frac{2,77,320}{20,00,000} \times 100 = 13.86\%$$

k_0 based on Market Value Weights :

Debentures	₹ 8,80,000	9.69%	85,272
Preference Shares	2,40,000	14.90%	35,760
Equity Shares	22,00,000	17.00%	3,74,000
	33,20,000		4,95,032

$$\text{So, } k_0 = \frac{4,95,032}{33,20,000} \times 100 = 14.91\%$$

Illustration 5.17

The following information is provided in respect of the specific cost of capital of different sources along with the book value (BV) and market value (MV) weights.

Source	C/C	BV	MV
Equity share capital	18%	.50	.58
Preference share	15%	.20	.17
Long term debts	7%	.30	.25

(*i*) Calculate the Weighted Average Cost of Capital, WACC, using both the BV and the MV weights.

(*ii*) Calculate the WMCC using marginal weights given that the company intends to raise additional funds using 50% long term debts, 35% preference share and 15% by retaining profits.

Solution :

(*i*) The WACC on the basis of BV and MV weights may be calculated as follows :

Source	BV	MV	C/C	BV × C/C	MV × C/C
Equity share capital	.50	.58	.18	.090	.1044
Preference shares	.20	.17	.15	.030	.0255
Long term debt	.30	.25	.07	.021	.0175
				.141	.1474

The WACC based on BV weights is 14.1%, and

The WACC based on MV weights is 14.74%.

(*ii*) The WMCC using marginal weights may be calculated as follows :

Source	Weights	C/C	W × C/C
Retained earnings	.15	.18	.027
Preference shares	.35	.15	.053
Long term debt	.50	.07	.035
			.115

Therefore, the WMCC is 11.5%.

Illustration 5.18

X Ltd. has assets of ₹ 32,00,000 that have been financed by ₹ 18,00,000 of equity shares (of ₹ 100 each), General Reserve of ₹ 3,60,000 and Debt of ₹ 10,40,000. For the year ended 31-3-2016 the company's total profits before interest and taxes were ₹ 6,23,000. X Ltd. pays 8% interest on borrowed capital and is in a 30% tax bracket. The market value of equity as on 31-3-2016 was ₹ 150 per share. What was the weighted average cost of capital ? Use market values as weights.

[B.Com.(H), D.U. 2010]

Solution :

$$k_d = .08\ (1 - .3) = 5.60\%$$

$$k_e = \frac{(6,23,000 - 83,200)\ (1 - .3)}{(18,000 \times 150)} = 14\%$$

Calculation of WACC (based on MV) :

Source	Amount	Weight	Sp. C/C	W × Sp. C/C
Equity Share Capital	22,50,000	.602	.140	.0849
Debt	10,40,000	.278	.056	.0156
General Reserve	4,50,000	.120	.140	.0168
	37,40,000	1.000		.1173

So, WACC (MV) is .1173 or 11.73%.

Illustration 5.19

The following is the capital structure of Simons Company Ltd.

Equity shares: 10,000 shares of ₹ 100 each	₹ 10,00,000
10% Preference Shares of ₹ 100 each	4,00,000
8.57% Debentures	6,00,000
	20,00,000

The market price of the company's share is ₹ 110 and it is expected that a dividend of ₹ 10 per share would be declared after 1 year. The dividend growth rate is 6% :

(*i*) If the company is in the 30% Tax bracket, compute the weighted average cost of capital.

(*ii*) Assuming that in order to finance an expansion plan, the company intends to borrow a fund of ₹ 10 lacs bearing 10% rate of interest, what will be the company's revised weighted average cost of capital? This financing decision is expected to increase dividend from ₹ 10 to ₹ 12 per share. However, the market price of equity share is expected to decline from ₹ 110 to ₹ 105 per share.

Solution :

(*i*) **Computation of the Weighted Average Cost of Capital**

Source	Weight (W)	C/C	W × C/C
Equity share	0.5	15.09	7.54
10% Preference share	0.2	10.00	2.00
8.57% Debentures	0.3	6.00	1.80
Weighted Average Cost of Capital			11.34

(*ii*) **Computation of Revised Weighted Average Cost Capital**

Source	W	C/C	W × C/C
Equity Shares	0.333	17.42	5.80
10% Preference shares	0.134	10.00	1.33
10% Debentures	0.200	6.00	1.20
10% Loan	0.333	7.00	2.33
Revised Weighted Average Cost of Capital			10.66

Working notes:

(1) Cost of Equity shares (k_e) (Present)

$$k_e = \frac{D_1}{P_0} + g$$

$$= \frac{10}{110} + 0.06 \quad = 0.1509 \text{ or } 15.09\%$$

(2) Revised Cost of Equity shares (k_e)

$$\text{Revised } k_e = \frac{12}{105} + 0.06 = 0.142 \text{ or } 17.42\%.$$

Illustration 5.20

XYZ Ltd. wishes to raise additional funds of ₹ 10,00,000 to take up an investment proposal. Following information is provided :

Retained Earnings	₹ 2,10,000
Earnings Per share	₹ 4
Dividend Payout Ratio	50%
Expected Growth Rate	10%
Current Market Price of Share	₹ 44
Debt-Equity Mix	30%/70%
Cost of Debts (before tax) :	
Funds upto ₹ 2,00,000	10%
Funds More than ₹ 2,00,000	13%
Tax Rate	30%

You are required to:

(*i*) Determine the pattern for raising additional funds.

(*ii*) Determine the Cost of Equity and Cost of Retained Earnings.

(*iii*) Determine the Required Rate of Return for the new Project.

Solution :

Pattern of Additional Funds :

Total Funds required	₹ 10,00,000
Debt (30%)	₹ 3,00,000
Equity (70%)	₹ 7,00,000
– Retained Earnings	2,10,000
New Equity required	4,90,000
New Debt (₹ 3,00,000) to be raised at	13%
After tax cost of debt (k_d) (13×.7)	9.1%

Cost of Equity and Retained Earnings (k_e & k_r):

EPS	= ₹ 4	Dividend Payout	50%
D_0	= ₹ 2	Growth Rate	10%
D_1	= ₹ 2.20	P_0	= ₹ 44

$$\text{Now } k_e = k_r = \frac{D_1}{P_0} + g = \frac{2.20}{44} + .10 = 15\%$$

Calculation of WACC :

Source	Amount	Weight	Sp. c/c	W × Sp. c/c
Equity	₹ 7,00,000	.70	.150	.1050
Debt	3,00,000	.30	.091	.0273
				.1323 or 13.23%

Illustration 5.21

The ABC company has the following capital structure and is considered to be an optimum.

Equity share capital (1,00,000 shares)	₹ 16,00,000
11% Preference share capital	1,00,000
16% Debentures	3,00,000
	20,00,000

The company has paid a dividend of ₹ 2.36 with a growth rate of 10%. The company's share has a current market price of ₹ 23.60 per share. The expected dividend per share next year is 50% of the dividend for the current year. The 16% new debentures can be issued by the company. The company's debentures are currently selling at ₹ 96 per debenture. The new 11% preference share can be sold at a net price of ₹ 9.15 (face value ₹ 10 each). The company's tax rate is 30%.

(*a*) Calculate the after tax cost of (*i*) new Debt, (*ii*) new Preference share capital, and (*iii*) Equity shares assuming new equity comes from retained earnings.

(*b*) Also calculate the Marginal Cost of Capital, WMCC.

Solution :

Since the present capital structure is assumed to be optimum, the optimum proportions of different components are 80%, 5% and 15% for equity share capital, preference share capital and debentures respectively.

After tax cost of Debt:

$$k_d = ₹ 16/96 = .1667$$

$$= .1667\ (1 - .3) = 11.67 \text{ or } 11.67\%$$

After tax cost of Preference share capital:

$$k_p = ₹ 1.1/9.15 = .12 = 12\%$$

After tax cost of Retained Earnings:

$$k_r = k_e = (D_1/P_0) + g$$

$$= (₹ 1.18/23.60) + .10 = .15 \text{ or } 15\%.$$

Note : *The current dividend is given at ₹ 2.36 and for the next year the dividend will be 50% of this amount. Therefore, D_1 = ₹ 1.18.*

Calculation of Marginal Cost of Capital : The marginal cost of capital is the weighted average cost of capital of the new financing. Since the present capital structure is optimal, the firm would raise new funds in the same proportion. The WMCC may be ascertained as follows :

Source	Weight	C/C	W × C/C
Equity share capital	.80	.1500	.1200
11% Pref. share capital	.05	.1200	.0060
Debentures	.15	.1167	.0175
	WMCC		.1435

So, the WMCC of the firm is 14.35%.

Illustration 5.22

The XYZ & Co., wishes to find out its weighted marginal cost of capital, WMCC, based on target capital structure proportions. Using the data given below, find out the WMCC and also show the WMCC curve.

Source	Proportion	Range	Cost
Equity share capital	50%	Up to ₹ 3,00,000	13.00%
		3,00,000–7,50,000	13.30%
		7,50,000 and above	15.50%
Preference shares	10%	Up to ₹ 1,00,000	9.33%
		1,00,000 and above	10.60%
Long term debt	40%	Up to ₹ 4,00,000	5.68%
		4,00,000–8,00,000	6.50%
		8,00,000 and above	7.10%

Solution :

Determination of Breaking points of different sources:

Source	Prop.	Cost	Range	Breaking Points
Equity capital	.50	13.00%	Up to ₹ 3,00,000	3,00,000/.50 = 6,00,000
		13.30%	3,00,000–7,50,000	7,50,000–50 = 15,00,000
		15.50%	7,50,000 and above	—
Pref. shares	.10	9.33%	Up to ₹ 1,00,000	1,00,000/.10 = 10,00,000
		10.60%	1,00,000 and above	–
L. Term debt	.40	5.68%	Up to ₹ 4,00,000	4,00,000/.40 = 10,00,000
		6.50%	4,00,000–8,00,000	8,00,000/.40 = 20,00,000
		7.10%	8,00,000 and above	—

Now, the WMCC for different ranges of new financing may be calculated as follows :

Range	Source	Prop.	C/C %	W×C/C %
Up to ₹ 6,00,000	Equity shares	50	13.00	6.50
	Preference shares	.10	9.33	.93
	Long term debt	.40	5.68	2.27
	WMCC			9.70
₹ 6,00,000–10,00,000	Equity shares	.50	13.30	6.65
	Preference shares	.10	9.33	.93
	Long term debt	.40	5.68	2.27
	WMCC			9.85
₹ 10,00,000–15,00,000				
	Equity shares	.50	13.30	6.65
	Preference shares	.10	10.60	1.06
	Long term debt	.40	6.5	2.60
	WMCC			10.31
₹ 15,00,000–20,00,000	Equity shares	.50	15.50	7.75
	Preference shares	.10	10.60	1.06
	Long term debt	.40	6.50	2.60
	WMCC			11.41
₹ 20,00,000 and above	Equity shares	.50	15.50	7.75
	Preference shares	.10	10.60	1.06
	Long term debt	.40	7.10	2.84
	WMCC			11.65

The WMCC curve for the firm has been presented in Figure 5.3.

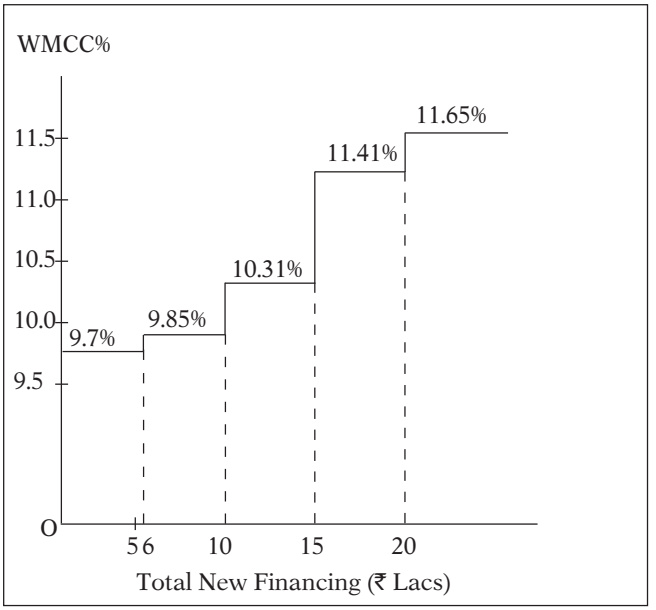

FIGURE 5.3 : WEIGHTED MARGINAL COST OF CAPITAL.

OBJECTIVE TYPE QUESTIONS

State whether each of the following statements is ***True (T)*** *or* ***False (F).***

(*i*) The cost of capital is the required rate of return to maintain the value of the firm.

(*ii*) Different sources of funds have a specific cost of capital related to that source only.

(*iii*) Cost of capital does not comprise any risk premium.

(*iv*) Cost of capital is basic data for NPV technique.

(*v*) Risk free interest rate and cost of capital are same things

(*vi*) Different sources have same cost of capital.

(*vii*) Tax liability of the firm is relevant for cost of capital of all the sources of funds.

(*viii*) Cost of debt and Cost of Pref. share capital, both, require tax adjustment.

(*ix*) Every source of fund has an explicit cost of capital.

(*x*) WACC is the overall cost of capital of the firm.

(*xi*) Cost of debt is the same as the rate of interest.

(*xii*) Cost of Pref. share capital is determined by the rate of fixed dividend.

(*xiii*) Cost of Equity share capital depends upon the market price of the share.

(*xiv*) Cost of existing share capital and fresh issue of capital are same.

(*xv*) Retained earnings have implicit cost only

[**Answers :** *(i) T, (ii) T, (iii) F, (iv) T, (v) F, (vi) F, (vii) F, (viii) F, (ix) F, (x) T, (xi) F (xii) T, (xiii) T, (xiv) F, (xv) T.*]

MULTIPLE CHOICE QUESTIONS

1. Cost of Capital refers to :
- (*a*) Flotation Cost,
- (*b*) Dividend,
- (*c*) Required Rate of Return,
- (*d*) None of the above.

2. Which of the following sources of funds has an Implicit Cost of Capital?
- (*a*) Equity Share Capital,
- (*b*) Preference Share Capital,
- (*c*) Debentures,
- (*d*) Retained earnings.

3. Which of the following has the highest cost of capital?
- (*a*) Equity shares,
- (*b*) Loans,
- (*c*) Bonds,
- (*d*) Preference Shares.

4. Cost of Capital for Government securities is also known as :
- (*a*) Risk-free Rate of Interest,
- (*b*) Maximum Rate of Return,
- (*c*) Rate of Interest on Fixed Deposits,
- (*d*) None of the above.

5. Cost of Capital for Bonds and Debentures is calculated on :
- (*a*) Before-Tax basis,
- (*b*) After-Tax basis,
- (*c*) Risk-free Rate of Interest basis,
- (*d*) None of the above.

6. Weighted Average Cost of Capital is generally denoted by :
- (*a*) k_A,
- (*b*) k_W,
- (*c*) k_O,
- (*d*) k_C,

7. Which of the following cost of capital require tax adjustment?
- (*a*) Cost of Equity Shares,
- (*b*) Cost of Preference Shares,
- (*c*) Cost of Debentures,
- (*d*) Cost of Retained Earnings.

8. Which is the most expensive source of funds?
- (*a*) New Equity Shares,
- (*b*) New Preference Shares,
- (*c*) New Debts,
- (*d*) Retained Earnings.

9. Marginal Cost of capital is the cost of :
- (*a*) Additional Sales,
- (*b*) Additional Funds,
- (*c*) Additional Interests,
- (*d*) None of the above.

10. In case the firm is all-equity financed, WACC would be equal to :
- (*a*) Cost of Debt,
- (*b*) Cost of Equity,
- (*c*) Neither (*a*) nor (*b*),
- (*d*) Both (*a*) and (*b*).

11. In case of partially debt-financed firm, k_0 is less than :
- (*a*) k_d,
- (*b*) k_e,
- (*c*) Both (*a*) and (*b*),
- (*d*) None of the above.

12. In order to calculate Weighted Average Cost of Capital, weights may be based on :
- (*a*) Market Values,
- (*b*) Target Values,
- (*c*) Book Values,
- (*d*) All of the above.

13. Firm's Cost of Capital is the average cost of :
- (*a*) All sources,
- (*b*) All borrowings,
- (*c*) All share capital,
- (*d*) All Bonds & Debentures.

14. An implicit cost of increasing proportion of debt is :
- (*a*) Tax shield would not be available on new debt,
- (*b*) P.E. Ratio would increase,

(*c*) Equity shareholders would demand higher return,

(*d*) Rate of return of the company would decrease.

15. Cost of Redeemable Preference Share Capital is :

(*a*) Rate of Dividend,

(*b*) After Tax Rate of Dividend,

(*c*) Discount Rate that equates PV of inflows and outflows relating to capital,

(*d*) None of the above.

16. Which of the following is true?

(*a*) Retained earnings are cost free,

(*b*) External Equity is cheaper than Internal Equity,

(*c*) Retained Earnings are cheaper than External Equity,

(*d*) Retained Earnings are costlier than External Equity.

17. Cost of capital may be defined as :

(*a*) Weighted Average cost of all debts,

(*b*) Rate of Return expected by Equity Shareholders,

(*c*) Average IRR of the Projects of the firm,

(*d*) Minimum Rate of Return that the firm should earn.

18. Minimum Rate of Return that a firm must earn in order to satisfy its investors, is also known as :

(*a*) Average Return on Investment,

(*b*) Weighted Average Cost of Capital,

(*c*) Net Profit Ratio,

(*d*) Average Cost of borrowing.

19. Cost of Capital for Equity Share Capital does not imply that :

(*a*) Market Price is equal to Book Value of share,

(*b*) Shareholders are ready to subscribe to right issue,

(*c*) Market Price is more than Issue Price,

(*d*) All of the three above.

20. In order to calculate the proportion of equity financing used by the company, the following should be used :

(*a*) Authorised Share Capital,

(*b*) Equity Share Capital plus Reserves and Surplus,

(*c*) Equity Share Capital plus Preference Share Capital,

(*d*) Equity Share Capital plus Long-term Debt.

21. The term capital structure denotes :

(*a*) Total of Liability side of Balance Sheet,

(*b*) Equity Funds, Preference Capital and Long term Debt,

(*c*) Total Shareholders Equity,

(*d*) Types of Capital Issued by a Company.

22. Debt Financing is a cheaper source of finance because of :

(*a*) Time Value of Money,

(*b*) Rate of Interest,

(*c*) Tax-deductibility of Interest,

(*d*) Dividends not Payable to lenders.

23. In order to find out cost of equity capital under CAPM, which of the following is not required :

(*a*) Beta Factor,

(*b*) Market Rate of Return,

(*c*) Market Price of Equity Share,

(*d*) Risk-free Rate of Interest.

24. Tax-rate is relevant and important for calculation of specific cost of capital of :

(*a*) Equity Share Capital,

(*b*) Preference Share Capital,

(*c*) Debentures,

(*d*) (*a*) and (*b*) above.

25. Advantage of Debt financing is :

(*a*) Interest is tax-deductible,

(*b*) It reduces WACC,

(*c*) Does not dilute owners control,

(*d*) All of the above.

[**Answers :** *1(c), 2(d), 3(a), 4(a), 5(b), 6(c), 7(c), 8(a), 9(b), 10(b), 11(b), 12(d), 13(a), 14(c), 15(c), 16(c), 17(d), 18(b), 19(d), 20(b), 21(b), 22(c), 23(c), 24(c), 25(d)*].

ASSIGNMENTS

1. Write short notes on:

(*a*) Implicit cost of capital.

(*b*) Target weights.

(*c*) Explicit cost of capital.

(*d*) Weighted Average Cost of Capital

2. Why is the cost of capital most appropriately measured on after-tax basis? What effect does this have on specific cost of capital?

3. What is the relevance and significance of cost of capital in capital budgeting? How does the cost of capital enter the capital budgeting process?

4. The cost of preference share capital is generally lower than the cost of equity. State the reasons.

(*B.Com. (H.), D.U., 2014*)

5. Why is that the debt cheapest source of finance for a profit making firm?

6. How can you determine the cost of equity capital in a growth firm?

7. "As there is no explicit cost of retained earnings, these funds are free of cost". Critically comment.
(*B.Com. (H.), D.U., 2011*)

8. "New issue of capital is costlier than the retained earnings". How and what makes these two to differ?
(*B.Com. (H.), D.U., 2004*)

9. Retained earnings are free of cost. Do you agree?
(*B.Com. (H.), D.U., 2017*)

10. State the different approaches to the calculation of cost of equity. Are retained earnings cost free?
(*B.Com. (H.), D.U., 2007, 2009, 2012*)

11. What are the merits of using market value weights in computing weighted average cost of capital?

12. "Cost of retained earnings is same as cost of equity". Comment. (*B.Com. (H.), D.U., 2005*)

13. Book Value *vs.* Market Value weights in Cost of Capital.
(*B.Com. (H.), D.U., 2005*)

14. 'Cost of existing share capital and fresh issue of capital are always same'? Do you agree? Give reasons.
(*B.Com. (H.), D.U., 2009*)

15. Does a firm's tax rate affect its cost of capital? What is the effect of flotation costs associated with a new security issue on the firm's cost of capital ?
(*B.Com. (H.), D.U., 2010*)

16. Explain, in brief the weights that you would take into consideration for computing weighted cost of capital. Why are market value weights considered superior to the book value weights ? (*B.Com. (H.), D.U., 2010*)

17. What are implicit costs and how are these relevant in calculating weighted average cost of capital ?
(*B.Com. (H.), D.U., 2013*)

18. The cost of preference share capital is generally lower than the cost of equity. State the reasons.
(*B.Com. (H.), D.U., 2014*)

19. What is meant by Cost of Capital? What are its components? How is the cost of retained earnings estimated?
(*B.Com. (H.), D.U., 2015*)

20. 'Market Value Weights' are superior to 'Book Value Weights'. Comment.
(*B.Com. (H.), D.U., 2015*)

PROBLEMS

P5.1 Calculate the cost of capital in each of the following cases :

(*i*) A 7-year ₹ 100 bond of a firm can be sold for a net price of ₹ 97.75 and is redeemable at a premium of 5%. The coupon rate of interest is 10% and the tax rate is 32.5%.

(*ii*) A company issues 10% Irredeemable Preference Shares at ₹ 105 each (FV = 100).

(*iii*) The current market price of share is ₹ 90 and the expected dividend at the end of current year is ₹ 4.50 with a growth rate of 8%.

(*iv*) The current market price of a share is ₹ 134. The company has just paid a dividend of ₹ 3.50 with expected growth of 15% over next 6 years and a growth rate of 8% thereafter.

(*v*) The current market price of share is ₹ 100. The firm needs ₹ 1,00,000 for expansion and the new shares can be sold only at ₹ 95. The expected dividend at the end of current year is ₹ 4.75 with a growth rate of 6%. Also calculate the cost of capital of new equity.

(*vi*) A company is about to pay a dividend of ₹ 1.40 per share having a market price of ₹ 19.50. The expected future growth in dividends is estimated at 12%.

[*Answers :* (*i*) 7.74%, (*ii*) 9.52%, (*iii*) 13%, (*iv*) 12%, (*v*) 10.75% and 11% and (*vi*) 20.66%.]

P5.2 (*a*) A company raised preference share capital of ₹ 1,00,000 by the issue of 10% preference shares of ₹ 10 each. Find out the cost of preference share capital when it is issued at (*i*) 10% premium, and (*ii*) 10% discount.

(*b*) A company has 10% redeemable preference shares which are redeemable at the end of 10th year from the date of issue. The underwriting expenses are expected to 2%. Find out the effective cost of preference share capital.

(*c*) The entire share capital of a company consist of 1,00,000 equity shares of ₹ 100 each. Its current earnings are ₹ 10,00,000 p.a. The company wants to raise additional funds of ₹ 25,00,000 by issuing new shares. The floatation cost is expected to be 10% of the face value. Find out the cost of new equity capital given that the earnings are expected to remain same for coming years.

[*Answers :* (*a*) 9.09% and 11.11%, (*b*) 10.3%, (*c*) 11.1%.]

P5.3 A company is considering raising of funds of about ₹ 100 lakhs by one of two alternative methods, viz, 14% institutional term loan or 13% non-convertible debentures. The term loan option would attract no major incidental cost. The debentures would have to be issued at a discount of 2.5% and would involve cost of issue of ₹ 1,00,000.

Advise the company as to the better option based on the effective cost of capital in each case. Assume a tax rate of 30%.

[*Answer :* 13% NCD has an effective cost of 9.43% and hence is better.]

P5.4 The shares of a company are being currently sold at ₹ 20 per share. It has just paid a dividend of ₹ 2 for the last year. The profits of the company are expected to show a growth of 10% p.a. and the company maintains a 100% payout ratio. Determine the cost of equity capital of the company.

What should be the expected current price of the share if the growth rate is (*i*) 8% or (*ii*) 12%.

[*Answer :* k_e = 21%, Expected price would be (*i*) ₹ 16.61 or (*ii*) ₹ 24.88]

P5.5 The following is the capital structure of a firm:

Source of finance	Amount (₹)	C/C
11% Preference share capital	1,00,000	11%
Equity share capital	4,50,000	18%
Retained earnings (Reserves)	1,50,000	18%
11.43% Debt	3,00,000	8%

Calculate the weighted average cost of capital of the firm, based on the book value weights.

[*Answer :* WACC is 14.3%.]

P5.6 From the following information, determine the cost of equity capital using the CAPM approach.

(*i*) Required rate of return on risk-free security 12%.

(*ii*) Required rate of return on market portfolio of investment is 15%.

(*iii*) The firm's beta is 1.6.

[*Answer :* k_e is 16.8%.]

P5.7 The following is the extract from the financial statements of ABC Ltd.

Operating Profit	₹ 153 lacs
–Interest on Debentures	₹ 33 lacs
–Income Tax	₹ 36 lacs
Net Profit	₹ 36 lacs
Equity share capital (of ₹ 10 each)	₹ 200 lacs
Reserve and Surplus	₹ 100 lacs
15% Debentures (₹ 100 each)	₹ 220 lacs
Total	₹ 520 lacs

The market price of equity share and debenture is ₹ 12 and ₹ 93.75 respectively. Find out (*i*) EPS, (*ii*) % cost of capital of equity and debentures.

[*Answer :* EPS is ₹ 1.80; $k_e = 15\%$ and $k_d = 8\%$.]

P5.8 PQR Ltd. is attempting to find out the cost of equity shares it is proposing to issue. The current price of the equity share is ₹ 64 per share and the flotation cost of new share is ₹ 2.50 per share. The dividend of ₹ 3 is expected at the end of current year and the dividends paid for the last 6 years are ₹ 2.34, 2.43, 2.54, 2.65, 2.75 and ₹ 2.86 respectively. Find out the growth rate, cost of retained earnings and cost of equity capital.

[*Answer :* $g = 4\%$, $k_r = 8.7\%$ and $k_e = 8.88\%$.]

P5.9 XYZ Ltd. has an annual profit of ₹ 50,000 and the required rate of return of the shareholders is 10%. It is further expected that the shareholders will have to incur 3% brokerage cost of the dividends received and invested by them for making new investments. Find out the cost of retained earnings to the firm given that the tax rate applicable to shareholders is 30%.

[*Answer:* $k_r = 6.79\%$.]

P5.10 The ABC Company has the total capital structure of ₹ 80,00,000 consisting of :

Ordinary shares (2,00,000 shares)	50.0%
10% Preference shares	12.5%
10% Debentures	37.5%

The shares of the company sells for ₹ 20. It is expected that company will pay next year a dividend of ₹ 2 per share which will grow at 7% forever. Assume a 30% tax rate. You are required to:

(*a*) Compute a weighted average cost of capital based on existing capital structure.

(*b*) Compute the new weighted average cost of capital if the company raises an additional ₹ 20,00,000 debt by issuing 10.72% Debenture. This would result in increasing the expected dividend to ₹ 3 and leave the growth rate unchanged, but the price of share will fall to ₹ 15 per share.

(*c*) Compute the cost of capital if in (*b*) above, growth rate increases to 10%.

[*Answers :* (*a*) WACC 12.37%, (*b*) WACC 15.4%, (*c*) WACC 16.6%.]

P5.11 A company has the following amount and specific costs of each type of capital:

Type of capital	Books Value	Market Value	Specific Costs
Preference	₹ 1,00,000	₹ 1,10,000	8.0%
Equity	6,00,000	12,00,000	13.0%
Retained earnings	2,00,000	—	—
Debt	4,00,000	3,80,000	5.0%
Total	13,00,000	16,90,000	

Determine the weighted average cost of capital using (*a*) Book value weights and, (*b*) Market value weights. How are they different? Can you think of a situation where the weighted average cost of capital would be the same using either of the weights?

[*Answer :* WACC(BV) 10.1% and WACC(MV) 10.9%.]

P5.12 The following is the capital structure of Simons Company Ltd. as on 31.12.2010 :

Equity shares : 10,000 shares (of ₹ 100 each)	₹ 10,00,000
10% Preference Shares (of ₹ 100 each)	4,00,000
12% Debentures	6,00,000
	20,00,000

The market price of the company's share is ₹ 110 and it is expected that a dividend of ₹ 10 per share would be declared after 1 year. The dividend growth rate is 6% :

(*i*) If the company is in the 40% tax bracket, compute the weighted average cost of capital (BV).

(*ii*) Assuming that in order to finance an expansion plan, the company intends to borrow a fund of ₹ 10 lacs bearing 14% rate of interest, what will be the company's revised weighted average cost of capital ? This financing decision is expected to increase dividend from ₹ 10 to ₹ 12 per share. However, the market price of equity share is expected to decline from ₹ 110 to ₹ 105 per share.

[*Answers :* (*i*) WACC is 11.70%, (*ii*) Revised WACC is 11.38% and Revised k_0 is 17.43%] [*B.Com.(H.), D.U.), 2009*]

P5.13 Calculate the existing and revised WACC based on 'Market value weights for the P5.12.

[*Answers :* (*i*) WACC is 11.86%, (*ii*) Revised WACC is 11.48%, and (*iii*) Revised k_e is 11.43%]

CHAPTER

6

Financing Decision : Leverage Analysis

"Because some elements of operating expenses are fixed, total operating expenses do not rise as rapidly as sales revenue. Therefore, operating profits rise faster than sales. In addition, non-operating expenses such as interest payments, are also relatively fixed. Hence, net corporate profits (after interest charges) rise even faster than operating profits. These two factors are referred to as operating leverage and financial leverage. These two leverage factors amplify the effects of the basic business cycle. Operating Leverage is defined in terms of the relationship between fixed and variable operating expenses. The term financial leverage refers to the mix of debt and equity used to finance the firm's activities. The degree of leverage can be measured in stock terms by using the ratio of debt to equity. Alternatively, leverage can be defined in flow terms, by using the ratio of interest payments to EBIT."[1]

SYNOPSIS

- Concept of Leverages.
- Operating Leverage.
  - Importance of Operating Leverage.
- Financial Leverage.
  - Importance of Financial leverage.
- Combined Leverage.
- Leverage Analysis and Risk of the Firm.
- Graded Illustrations in Leverage Analysis.

1. Soloman, Ezra and Pringle, J.J., *An Introduction to Financial Management,* Prentice Hall of India (P) Lid., Indian Reprint, p. 441.

The financing decisions have two components. First, to decide as to how much total funds are needed, and second, to decide the sources or their combinations to raise such funds. The total quantity of funds needed, however, depends upon the investment decisions of the firm. Given that the firm has good estimates of how much capital funds are needed, the problem then remains one of determining the best mix of different sources to be used in raising the required funds.

Determining an appropriate financial mix for the firm is not an easy job. At this stage, it is necessary to distinguish between the financial structure and capital structure. The financial structure refers to the mix of all funds sources that appear on the liability side of the balance sheet. On the other hand, the term capital structure refers to the mix of long-term sources of funds. Simply speaking, financial structure is the sum of capital structure and current liabilities. This relationship has been shown in Figure 6.1

BALANCE SHEET

	Liabilities	Assets
Financial Structure / Capital Structure	Equity Share Capital	
	Preference Share Capital	
	Reserves & Surplus	
	Long-term Debt	
	Current Liabilities	
	Total	Total

FIG. 6.1 : FINANCIAL STRUCTURE AND CAPITAL STRUCTURE

Financial structure designing requires attention on following two questions:

(*a*) What should be the maturity composition of firms total sources of funds *i.e.*, what should be the relationship between long-term and short-term sources of funds?

(*b*) In what proportion the funds be arranged from various long-term sources?

Capital structure analysis and management deals with the second question, namely the mix in which long-term (permanent) sources of funds be raised by the firm so as to maximise the market price of equity shares of the company. Part IV of the book deals with this question.

The process that leads to the final choice of the capital structure is referred to as the capital structure planning. A firm may use several techniques that allow it to quantify the risk-return characteristic of the alternative capital structures. Two of such techniques, which are widely used, are the Leverage Analysis and the EBIT-EPS Analysis. The former is discussed in the present chapter, while the latter is taken up in the next chapter.

The Earning Before Interest and Taxes (EBIT) for any given firm is subject to many influences, some particular to a firm and some others common to all the firms in the industry or general economic conditions that affect all the firms. In practice, the EBIT in any period may be higher or lower than expected. This uncertainty with respect to EBIT is generally referred to as business risk or operating risk. One major source of operating risk is the business fluctuations and in particular, the possibility of economic recession. No matter what happens to EBIT, a fixed amount of interest must be paid to the debt investors. Consequently, the residual profit (which is available to shareholders) also varies in response to change in EBIT. When EBIT falls, a major portion of the decline is ultimately deducted from the earnings going to the equity shareholders. As a result, the greater the use of debt financing, the more sensitive is the earnings going to equity shareholders to a change in EBIT. The present chapter attempts to analyze the relationship between the debt financing in the capital structure and its effect on the earnings available to the equity shareholders. The relationship can be analyzed in terms of the operating leverage and financial leverage.

CONCEPT OF LEVERAGE

The term leverage, in general, refers to a relationship between two interrelated variables. With reference to a business firm, these variables may be costs, output, sales revenue, EBIT, Earnings Per Share (EPS) *etc.* In financial analysis, the leverage reflects the responsiveness or influence of one financial variable over some other financial variable. It helps understanding the relationship between any two variables. In the leverage analysis, the emphasis is on the measurement of the relationship of two variables rather then on measuring these variables. However, the two variables, for which the relationship is to be established and measured, should be interrelated, otherwise, the leverage study may not have any useful purpose to serve.

The leverage may be defined as the % change in one variable divided by the % change in some other variable or variables. Impliedly, the numerator is the dependent variable, say X, and the denominator is the independent variable, say Y. The leverage analysis thus, reflects as to how responsiveness is the dependent variable to a change in the independent variable. Algebraically, the leverage may be defined as

$$\text{Leverage} = \frac{\%\text{ Change in Dependent Variable}}{\%\text{ Change in Independent Variable}}$$

For example, a firm increased its sales promotion expenses from ₹ 5,000 to ₹ 6,000 *i.e.*, an increase of 20%. This resulted in the increase in number of unit sold from 200 to 300 *i.e.*, an increase of 50%. The leverage between the promotional expenses and the number of units sold may be defined as :

$$\text{Leverage} = \frac{\%\text{ Change in units sold}}{\%\text{ Change in Sales Promotion Expenses}}$$

$$= \frac{.50}{.20} = 2.5$$

This means that % increase in number of unit sold is 2.5 times that of % increase in sales promotion expenses. The operating profit of a firm is a direct consequence of the sales revenue of the firm and in turn the operating profit determines the profit

available to the equity shareholders. The functional relationship between the sales revenue and the EPS can be established through operating profits (EBIT) and has been shown in Figure 6.2.

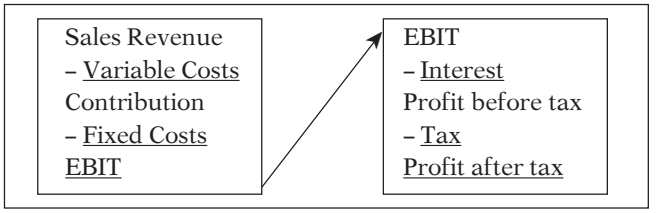

FIG. 6.2 : RELATIONSHIP BETWEEN SALES AND PROFIT

The left hand side of the above presentation shows that the level of EBIT depends upon the level of sales revenue and, the right hand side of the above presentation shows that the level of profit after tax or EPS depends upon the level of EBIT. The relationship between sales revenue and EBIT is defined as ***operating leverage*** and the relationship between EBIT and EPS is defined as ***financial leverage***. The direct relationship between the sales revenue and the EPS can also be established by the combining the operating leverage and financial leverage and is defined as ***combined leverage***.

Given the level of operating profit *i.e.,* EBIT, the financial manager should strive to maximize the EPS and for this purpose the understanding of financial leverage is essential. However, as the level of EBIT depends upon the sales revenue, the operating leverage should also be analyzed though the financial leverage is more important and directly relevant. Moreover, the operating leverage and financial leverage are related to each other. In the following discussion therefore, these two leverages have been first defined individually and then in terms of combined leverage.

OPERATING LEVERAGE

When the sales level increases or decreases, the EBIT also changes. The operating leverage measures the relationship between the sales revenue and the EBIT or in other words, it measures the effect of change in sales revenue on the level of EBIT. The operating leverage is calculated by dividing the % change in EBIT by the % change in sales revenue, or

$$\text{Operating Leverage} = \frac{\%\ \text{Change in EBIT}}{\%\ \text{Change in Sales Revenue}}$$

For example, ABC Ltd. sells 1000 unit @ ₹ 10 per unit. The cost of production is ₹ 7 per unit and the whole of the cost is variable in nature. The profit of the firm is 1,000 × (₹ 10 – ₹ 7) = ₹ 3,000. Suppose, the firm is able to increase its sales level by 40% resulting in total sales of 1400 units. The profit of the firm would now be 1400 × (₹ 10 – ₹ 7) = ₹ 4,200.

The operating leverage of the firm is:

$$\text{Operating Leverage} = \frac{\%\ \text{Change in EBIT}}{\%\ \text{Change in Sales Revenue}} = \frac{\text{Increase in EBIT} \div \text{EBIT}}{\text{Increase in Sales} \div \text{Sales}}$$

$$= \frac{₹\ 1{,}200 \div ₹\ 3{,}000}{₹\ 4{,}000 \div ₹\ 10{,}000} = 1$$

The Operating Leverage (OL) of 1 denotes that the EBIT level increases or decreases in direct proportion to the increase or decrease in sales level. This is due to the fact that there is no fixed costs and the total cost is variable in nature. Thus, impliedly, the profit level *i.e.,* the EBIT varies in direct proportion to the sales level. Now suppose that the firm has a fixed costs of ₹ 1,000 in addition to the variable costs of ₹ 7 per unit. The present and expected cost and profit structure of the firm may be expressed as follows :

	Present	Expected
Sales @ ₹ 10 per unit	₹ 10,000	₹ 14,000
– Variable Costs @ ₹ 7 per unit	7,000	9,800
Contribution	3,000	4,200
– Fixed Costs	1,000	1,000
EBIT	2,000	3,200

$$\text{Operating Leverage} = \frac{\%\ \text{Change in EBIT}}{\%\ \text{Change in Sales Revenue}} = \frac{\text{Increase in EBIT} \div \text{EBIT}}{\text{Increase in Sales} \div \text{Sales}}$$

$$= \frac{₹\ 1{,}200 \div ₹\ 2{,}000}{₹\ 4{,}000 \div ₹\ 10{,}000} = 1.5$$

The OL of 1.5 means that the % increase in level of EBIT is 1.5 times that of % increase in sales level. In this case, the % increase in EBIT is 60% (*i.e.,* increase of ₹ 1,200 over the present level of ₹ 2,000), and the % increase in sales is 40% (*i.e.,* increase of 400 units over the present level of 1,000 units). It means that for every increase of 1% in sales level, the % increase in EBIT would be 1.5%. In other words, it means that for every increase or decrease in sales level, there will be more than proportionate increase or decrease in the level of EBIT. This is due to the existence of fixed costs. It is already seen that when there was no fixed cost, the increase or decrease in EBIT was direct and proportional to the increase or decrease in sales level. The OL will always be greater than 1 for any firm which has a fixed cost element in its costs structure. In case there is no fixed cost, the OL is 1.

The above figures of 1 time or 1.5 times are known as the **Degree of Operating Leverage (DOL)**. Whenever, the % change in EBIT resulting from given % change in sales is greater than the % change in sales, the OL exists and the relationship is known as the DOL. This means that as long as the DOL is greater than 1, there is an OL. The OL emerges as result of existence of fixed element in the cost structure of the firm. The OL may be defined as firm's position or ability to magnify the effect of change in sales over the level of EBIT. The level of fixed costs, which is instrumental in bringing this magnifying effect also determines the extent of this effect. Higher the level of fixed costs in relation to variable cost, greater would be the DOL. The DOL may, at any particular sales volume, also be calculated as a ratio of contribution to the EBIT *i.e.,*

$$\text{Operating Leverage} = \frac{\text{Contribution}}{\text{EBIT}} = \frac{\text{Qty. (S.P–V.C.)}}{\text{Qty. (S.P. – V.C.) – F.C.}}$$

This formulation of the OL is however, static in nature and calculates the effect on EBIT for a change in given level of sales. If the level of sales changes, the DOL for the new level of sales may be different. For example, the DOL for a sales level of 1000 units and 1400 units is as follows :

Sales/Level	1000 Units	1400 Units
Sales @ ₹ 10 per unit	₹ 10,000	₹ 14,000
– Variable Costs @ ₹ 7 per unit	7,000	9,800
Contribution	3,000	4,200
– Fixed Costs	1,000	1,000
EBIT	2,000	3,200
	3,000	4,200
DOL=	2,000	3,200
	= 1.50	= 1.31

This means that if the firm is presently operating at a level of sales of 1000 units, the change from this level has a DOL of 1.5 times. However, if the firm is operating at the sales level of 1400 units, then the change from this level will have DOL of 1.31 times. Similarly, the firm will have different DOL at different levels of operations.

DOL can be used to find out the change in EBIT as a result of change in sales level. For example in the above case, the firm is presently operating at a sales of ₹ 10,000 and has DOL of 1.5. Now, if next year, the sales are expected to increase by 40% to ₹ 14,000, then the EBIT would increase by 40% × 1.5 = 60%. This can be verified in the above table when the EBIT has increased by 60% from ₹ 2,000 to ₹ 3,200. The relationship between sales, DOL and EBIT can be presented as follows:

$$\% \text{ Change in EBIT} = \% \text{ Change in Sales} \times \text{DOL}$$

The behaviour and direction of OL depends upon the state of sales level *vis-a-vis* the break-even level. If the firm is operating at a sales level above the break-even level, the DOL decreases with every increase in sales level. The reason being that the fixed costs become relatively smaller as compared to the total sales revenue. However, if the firm is operating at break-even level (where the contribution is just equal to the fixed costs and the EBIT is zero) then the DOL for this firm cannot be defined. Say, the firm is operating at 333 units of sales, the DOL for the firm is

$$\text{DOL} = \frac{\text{Contribution}}{\text{EBIT}} = \frac{₹\ 1{,}000}{0} = \text{Undefined}$$

Thus, on the basis of the above analysis, the OL may be interpreted as follows :

1. The OL is the % change in EBIT as a result of 1% change in sales.
2. OL arises as a result of fixed cost in the cost structure. If there is no fixed cost, there will be no OL and the % change in EBIT will be same as % change in sales.
3. Higher the fixed cost, greater would be the OL and larger would be the magnifying effect of change in sales on change in EBIT.
4. A positive DOL means that the firm is operating at a level higher than the break-even level and both the EBIT and sales will vary in the same direction.
5. A negative DOL means that the firm is operating at a level lower than the break-even level; and the EBIT will be negative.

Importance and Significance of Operating Leverage : As already mentioned, the introduction of fixed costs into the cost structure of a firm tends to magnify the operating profits at higher level of operations. This is due to the incremental contribution each additional unit provide. Depending upon the proportion of fixed and variable costs in the cost structure, the incremental contribution can result in a sizable jump in the operating profits. Once all fixed costs are recovered by the contributions, profits grow proportionately faster than the growth in volume. Unfortunately the same effect holds for declining volumes also, which result in decline in profit and acceleration of losses disproportionate to the rate of volume reduction.

Analysis of operating leverage of a firm is very useful to the financial manager. It tells the impact of change in sales on the level of operating profits of the firm. A firm having higher DOL can experience a magnified effect on EBIT for even a small change in sales level. Higher DOL can dramatically increase the operating profit. Nevertheless, the EBIT may disappear and even give place to operating loss if there is a decline in sales.

Therefore, a firm should always try to avoid operating under high DOL. A high DOL condition is a high risk situation and even a small decrease in sales can excessively affect the firm's efforts to record profits. On the other hand, a firm should try to operate at a level sufficiently higher than the break-even level so that the chances of loss due to fluctuations in sales are minimized.

FINANCIAL LEVERAGE

The Financial Leverage (FL) measures the relationship between the EBIT and the EPS and it reflects the effect of change in EBIT on the level of EPS. The FL measures the responsiveness of the EPS to a change in EBIT and is defined as the % change in EPS divided by the % change in EBIT. Symbolically,

$$\text{Financial Leverage} = \frac{\%\text{ Change in EPS}}{\%\text{ Change in EBIT}} = \frac{\text{Increase in EPS} \div \text{EPS}}{\text{Increase in EBIT} \div \text{EBIT}}$$

It may be noted that the EBIT is a dependent variable in the OL and was determined by the sales level. However, in case of the FL, the EBIT is an independent variable and now is determining the level of EPS. That is why the EBIT is called a linking point in the leverage study.

To continue with the example of OL, the firm is having presently an EBIT level of ₹ 2,000. This profit is available for the payment of interest cost and for earnings distributions among the shareholders. Suppose, the tax rate applicable to the firm is 30% and there is no debt financing. The total funds employed by the firm are, say, ₹ 7,000 represented by 700 equity shares of ₹ 10 each. Now, the EPS of the firm may be determined as follows :

$$EPS = \frac{(EBIT - Interest) \times (1 - t)}{Number\ of\ Shares}$$

$$= \frac{(2{,}000 - 0) \times (1 - .3)}{700} = ₹\ 2$$

So, the firm is having an EPS of ₹ 2, Now, assume that the total funds requirements of ₹ 7,000 is partly financed by the issue of 10% debentures to the extent of ₹ 1,000 and balanced is financed by the issue of 600 equity shares of ₹10 each. In this case, the EPS is

$$EPS = \frac{(2{,}000 - 100) \times (1 - .3)}{600} = ₹\ 2.22$$

So, the EPS of the firm has increased from ₹ 2 to ₹ 2.22. Let the 10% debentures be increased by another ₹ 1,000 (however, total funds requirement pegged at ₹ 7,000 only). The remaining funds of ₹ 5,000 are arranged by the issue of 500 equity shares of ₹ 10 each. In this case, the EPS is

$$EPS = \frac{(2{,}000 - 200) \times (1 - .3)}{500} = ₹\ 2.52$$

So, the EPS of the firm has again increased to ₹ 2.52. It may be noted that the EPS has shown a gradual increase when the debt proportion is increased. But the EBIT level was taken constant at ₹ 2,000. But what happens if the EBIT level also changes. Suppose, the sales level of the firm increase from 1000 units to 1400 units resulting in increase of EBIT from ₹ 2,000 to ₹ 3,200. The effect of this change on the EPS (assuming that there is no debt financing) can he expressed as follows:

Sales Level	1000 Units	1400 Units
EBIT	₹ 2,000	₹ 3,200
– Interest	—	—
–Tax @ 30%	₹ 600	₹ 960
Profit after Tax	₹ 1,400	₹ 2,240
Number of Share	700	700
EPS	₹ 2	₹ 3.20

The EBIT has increased by 60% (*i.e.,* from ₹ 2,000 to ₹ 3,200). The EPS has also increased by 60%) (*i.e.,* from ₹ 2 to ₹ 3.20). Thus, when the fixed interest charge in the form of interest on debt financing is not there, both the EBIT and EPS are increasing by the same percentages.

Now suppose, the firm has debt financing also and the firm has raised ₹ 2,000 by the issue of 10% debentures in order to part finance the total requirements of ₹ 7,000. In case the EBIT level increases from ₹ 2,000 to ₹ 3,200 the EPS for different levels of EBIT is :

Sales Level	1000 Units	1400 Units
EBIT	₹ 2,000	₹ 3,200
–Interest	₹ 200	₹ 200
Profit before Tax	₹ 1,800	₹ 3,000
–Tax @ 30%	₹ 540	₹ 900
Profit after Tax	₹ 1,260	₹ 2,100
Number of Share	500	500
EPS	₹ 2.52	₹ 4.20

In this case, the % increase in EBIT is 60% (*i.e.,* from ₹ 2,000 to ₹ 3,200). But the increase in EPS is 66.6% (*i.e.,* from ₹ 2.52 to ₹ 4.20). Thus, the % increase in EPS is higher than the % increase in EBIT. This is due to the existence of fixed interest charge *i.e.,* interest on 10% debentures. But how the fixed interest charge affects the level of EPS. In the above example, the firm has employed funds of ₹ 7,000 (₹ 5,000 from equity capital and ₹ 2,000 from debts) and the EBIT is ₹ 2,000. Thus, the firm is earning 28.57% (₹ 2,000 on the capital employed of ₹ 7,000), on the funds employed. However on the debt financing of ₹ 2,000, the interest is payable @ 10% only. Thus, in terms of cost-benefits, the cost of debt financing is 10% whereas, the benefit is 28.57%. The surplus generated by employing debt financing of ₹ 2,000 is in fact available to the shareholders and as a result the total earnings available to the shareholders has enhanced. Moreover, the fixed interest charge is tax deductible and provides a tax-shield. This tax shield provided by the interest charge further increases the earnings available to the shareholders. This has resulted in proportionately higher increase in EPS.

Thus, the FL which is defined as a % increase in EPS divided by the % increase in EBIT, emerges as a result of fixed financial charge against the operating profits of the firm. The fixed financial charge appears in case the funds requirements of the firm are partly financed by the debt financing which is generally a cheaper source of finance. By using this relatively cheaper source of finance *i.e.,* the debt financing, the firm is able to magnify the effect of change in EBIT on the level of EPS.

So, the FL may be defined as a % increase in EPS that is associated with a given % increase in the level of EBIT. The increase in EPS of the firm may be more than proportionate for increase in the level of EBIT. In other words, the effect of increase or decrease in EBIT is magnified on the level of EPS. The existence of fixed financing charge is instrumental to bring this magnifying effect and also determines the extent of this effect. Higher the level of fixed financial charge greater would be the FL. The FL may also be defined as :

$$Financial\ Leverage = \frac{EBIT}{EBIT - Financial\ Charge} = \frac{EBIT}{EBIT - Int.} = \frac{EBIT}{PBT}$$

FL in case of Preference Share Capital :

In case, the firm has issues preference share capital, then it has a fixed financial liability in terms of preference dividend also. The financial leverage in such cases can be found as follows:

$$\text{Financial Leverage} = \frac{\text{EBIT}}{\text{PBT} - \text{PD} \div (1 - t)}$$

As the preference dividend in India is subject to corporate dividend tax, the above formula can be modified to incorporate the corporate dividend tax also. In such cases, the amount of PD in the equation would be preference dividend + corporate dividend tax on that.

For example, a firm has an EBIT of ₹ 2,00,000. The interest liability is ₹ 30,000. It has issued 10% preference shares of ₹ 3,00,000 and 10,000 equity shares of ₹ 100 each. The average tax rate applicable to the firm is 40% and corporate dividend tax is 20%. The total liability of the firm in respect of preference dividend would be ₹ 30,000 + 6,000 = ₹ 36,000 and the financial leverage is

$$\text{Financial Leverage} = \frac{₹\ 2,00,000}{1,70,000 - 36,000 \div (1 - .4)} = 1.818$$

Suppose, the EBIT of the firm increases by 20% to ₹ 2,40,000 (*i.e.* ₹ 2,00,000 + 40,000). The EPS of the firm at existing level of EBIT and new EBIT would be as follows :

	Existing	New
EBIT	₹ 2,00,000	₹ 2,40,000
– Interest	30,000	30,000
Profit before Tax	1,70,000	2,10,000
–Tax @ 40%	68,000	84,000
Profit After Tax	1,02,000	1,26,000
– Pref. Dividend	30,000	30,000
– Corp. Div. Tax @ 20%	6,000	6,000
Net profit for Equity	66,000	90,000
No. of Equity shares	10,000	10,000
EPS	₹ 6.60	₹ 9.00

The EPS has increased by ₹ 2.40 and the % increase in EPS is 2.40 ÷ 6.60 = 36.36%. The FL of the firm is 1.818 and the EBIT increases in 20%, so the EPS should increase by 20 × 1.818 = 36.36%. Thus, the results are verified.

Like the OL, this formulation of FL is also static in nature and ascertained the effect on the EPS for a change in a given particular level of EBIT. So, for different levels of EBIT the Degree of Financial Leverage (DFL) would be different. For example, the DFL for the EBIT level of ₹ 2,000 and ₹ 3,200 is:

Sales Level	1000 Units	1400 Units
EBIT	₹ 2,000	₹ 3,200
– Interest	₹ 200	₹ 200
Profit before Tax	₹ 1,800	₹ 3,000
DFL=	2,000	3,200
	1,800	3,000
	= 1.1	= 1.06

This means that at the EBIT level of ₹ 2,000, the DFL is 1.11 *i.e.*, for every 1% change in EBIT from the present level of ₹ 2,000, the % increase in EPS would be 1.11%. So, when the EBIT increases by 60% from ₹ 2,000 to ₹ 3,200, the EPS increases by 66.6% (*i.e.*, 60% × 1.11) from ₹ 2.52 to ₹ 4.20.

The firm will have different DFL at different levels of EBIT. If the firm is operating, in the above case, at the EBIT level of ₹ 200 (*i.e.*, EBIT just equal to the fixed financial charge), the DFL is undefined.

$$\text{DFL} = \frac{\text{EBIT}}{\text{EBIT} - \text{Interest}} = \frac{₹\ 200}{0} = \text{Undefined}$$

This is also known as ***financial break-even level*** *i.e.*, the level of EBIT is just sufficient to cover the fixed financial charges only and there is no earnings available to the shareholders and hence no EPS as such. The concept of financial break even has been discussed in the next chapter. Further, the above explanation of the FL has shown that the EPS increases with every increase in debt financing. Does it mean that the EPS will increase invariably with every increase in debt financing ? To continue with the above example, suppose, the total funds employed by the firm are ₹ 25,000 financed by the issue of 1500 equity shares of ₹ 10 each and ₹ 10,000 by the issue of 10% debentures. What is the EPS and how it changes if the debt financing is increased to ₹ 15,000 ? The position may be expressed as follows :

Debt (10%)	₹ 10,000	₹ 15,000
EBIT	₹ 2,000	₹ 2,000
– Interest	₹ 1,000	₹ 1,500
Profit before Tax	₹ 1,000	₹ 500
– Tax @ 30%	₹ 300	₹ 150
Profit after Tax	₹ 700	₹ 350
Number of Share	1500	1000
EPS	₹ .47	₹ .35

In this case, the EPS has decreased from ₹ .47 to ₹ .35 when the 10% debt financing is increased from ₹ 10,000 to ₹ 15,000. Why ? Perusal of the above example will provide the answer. In this case, the firm is earning a return of 8% (*i.e.*, ₹ 2,000 on the total capital employed of ₹ 25,000) and is paying 10% interest to the debt investors. This excess amount payable to debt investors (over and above the earnings on their funds) results in lowering of the EPS as the shareholders will have to bear this burden. This happens, whenever the rate of return of the firm is less than the % interest on debt financing. This situation may be called ***unfavourable FL.***

A finance manager can easily find out whether the firm has prospects for FL or not. Debt financing is suggested only when the firm has prospects for FL. For this purpose, the financial manager should compare the cost of debt financing with the average Return on Investment (ROI) by the firm. Three situations may emerge as a consequence of this comparison as follows:

(*i*) **ROI is equal to the Cost of Debt:** In this case, the firm is just earning what is being paid to the suppliers of funds. It is neither sensible nor advisable to borrow the funds in this situation and the firm may not be able to generate any surplus by debt financing.

(*ii*) **ROI is less than Cost of Debt:** In this case, the firm will in fact incur losses if it employs borrowed funds or opts for debt financing. This situation as already noted is also known as ***Unfavourable FL***.

(*iii*) **ROI is more than Cost of Debt:** In this case, the firm is able to earn a return on funds employed at a rate higher than the cost of debt financing. The firm in this case may employ the debt financing. As more and more borrowed funds are employed by the firm, the benefits accruing to the shareholder will also increase. This situation is also known as Favourable FL or ***Trading on Equity.***

On the basis of the above discussion and analysis, the FL can be interpreted as follows :

(*a*) The FL is a % change in EPS as result of 1% change in EBIT.

(*b*) The FL emerges as a result of fixed financial cost (in the form of interest and preference dividend). If there is no fixed financial liability, there will be no FL. In such a case, the % change in EPS will be same as % change in EBIT.

(*c*) Higher the fixed financial cost, greater would be FL and larger would be the effect of change in EBIT on the change in EPS.

(*d*) A positive FL means that the firm is operating at a level of EBIT which is higher than the financial break-even level and both the EBIT and the EPS will vary in the same direction as the EBIT changes.

(*e*) A negative FL means that the firm is operating at a level lower than the financial break-even level and the EPS will be negative.

Importance and Significance of Financial Leverage : Analysis of FL is probably the most important tool in the hands of a financial manager who is engaged in framing the capital structure of the firm. Any firm can easily adopt an all-equity capital structure and thus can avoid the financial risk. But, then, why not to avail the benefits of cheaper debt financing?

With financial leverage, the advantage arises from the possibility that funds borrowed at a fixed interest rate can be used for investment opportunities earning a rate of return higher than the interest paid. The difference of course, accrues to the equity shareholders. Given the ability to make investments that consistently provide return above the fixed financial charge it will be advantageous for the firm to 'trade on equity'. This means borrowings as much as prudent debt-management permits, and thereby magnifying the returns to the equity shareholders. The opposite effect will of course, apply if the company fail to earn higher returns.

The employment of debt financing, no doubt, brings financial risk to the firm and therefore, a financial manager must be concerned with the effects of borrowings. He is required to trade-off between risk and return. As the degree of leverage increases, the probability (likelihood) of higher returns to shareholders also increases, but it also increases the likelihood of lower returns. With increased leverage, the expected return is higher, but a price is to be paid for this advantages-the firm must expose itself to the possibility of lower returns if the EBIT turns out to be low. The firm obtains a higher expected returns at the expense of greater risk only. If EBIT declines, because of a decrease in sales or increase in costs or both, then a chance of financial insolvency is inevitable. So, as with the investment decision, again a firm is faced with the ever present risk-return trade-off. The leverage has the costs as well as the benefits.

Operating Leverage and Financial Leverage : Both the OL and FL emerge for more or less the same reason. The OL appears if the firm has fixed operating costs (*i.e.,* the fixed costs) whereas the FL appears when the firm has a fixed financial charge (in the form of interest payment on debt financing). The fixed cost magnifies the effect of variability of the sales on the level of EBIT, and thus the OL increases the variability of the EBIT. On the other hand, fixed financial charge magnifies the effect of variability of the EBIT on the level of EPS and thus FL increases the variability of the EPS. So, there is a close similarity between OL and FL in that both present an opportunity to gain from the fixed nature of certain costs in relation to incremental profits.

On the basis of the analysis of the OL, a finance manager can determine the reasonable level of fixed cost. The FL on the other hand, helps in determining the level of fixed financial charge or in particular, in determining the extent of debt financing. As the debt financing is relatively a cheaper source, the FL may suggest for more and more use of debt financing. But with every increase in debt financing, the financial risk *i.e.,* the risk of bankruptcy also increases. Therefore, though the FL may suggest for higher debt financing in order to increase the EPS, yet a finance manager must strive to achieve a trade off between the cost and benefit of debt financing.

The OL and the FL are related to each other. The FL takes over where the OL leaves off. The OL and the FL, taken together, in fact multiply and magnify the effect of change in sales level on the EPS. The OL may be rightly called the leverage of the first order or first stage leverage whereas the FL may be called the leverage of the second order or second stage leverage.

COMBINED LEVERAGE

So far the OL and FL have been analyzed separately. The OL explains the business risk complexion of the firm whereas the FL deals with the financial risk of the firm. But a firm has to look into the overall risk or total risk of the firm, which is business risk plus the financial risk. Therefore, a financial manager should consider both the OL and the FL simultaneously.

The OL causes a magnified effect of the change in sales level on the EBIT level and if the FL is also considered simultaneously, then the change in EBIT will, in turn, have a magnified effect on the EPS. Thus, a firm having both the OL and the FL will have wide fluctuations in the EPS for even a small change in the sales level. This effect of change in sales level on the EPS is known as combined leverage.

The Combined Leverage (CL) is not a distinct type of leverage analysis, rather it is a product of the OL and the FL. The CL

may be defined as the % change in EPS for a given % change in the sales level and may be calculated as follows :

$$CL = OL \times FL$$

$$= \frac{\text{Contribution}}{\text{EBIT}} \times \frac{\text{EBIT}}{\text{PBT}} = \frac{\text{Contribution}}{\text{PBT}}$$

$$\text{or, } CL = \frac{\%\text{Change in EBIT}}{\%\text{Change in Sales}} \times \frac{\%\text{ Change in EPS}}{\%\text{ Change in EBIT}}$$

$$= \frac{\%\text{ Change in EPS}}{\%\text{ Change in Sales}}$$

To continue with an above example, the DOL and the DFL at the sales level of 1000 units are 1.5 and 1.11. The Degree of Combined Leverage (DCL) is :

$$DCL = DOL \times DFL$$

$$= 1.5 \times 1.11 = 1.66$$

This means that for every 1% increase in sales level, the EPS will increase by 1.66%. It may be verified by taking the sales level of 1000 units and increasing it by say, 10% as follows :

	Present	Expected
Units sold	₹ 1000	₹ 1100
Sales @ ₹ 10 per unit	10,000	11,000
–Variable Cost @ 7 per unit	7,000	7,700
Contribution	3,000	3,300
– Fixed Costs	1,000	1,000
EBIT	2,000	2,300
– Interest	200	200
Profit before Tax	1,800	2,100
Tax @ 30%	540	630
Profit after Tax	1,260	1470
Number of Equity shares	500	500
EPS	2.52	2.94

The sales level has increased by 10% from ₹ 10,000 to ₹ 11,000, whereas the EPS has increased by 16.67% from ₹ 2.52 to ₹ 2.94. The % increase in EPS is 1.66 times that of increase in sales level. This coefficient 1.66 is the DCL and is the same already calculated.

Thus, the CL explains as to how the OL and FL interact and a change in sales level produces a magnified change in the EPS. The CL may be interpreted as follows :

(*i*) The CL is the % change in EPS resulting from a 1% change in sales level.

(*ii*) A positive CL means that the leverage is being computed for a sales level higher than the break-even level and both the EPS and sales will vary in the same direction.

(*iii*) A negative CL means that the leverage is being calculated for a sales level lower than the financial break-even level; and the EPS will be negative.

The OL and the FL can be employed in different combinations and may produce still the same CL. For example, the OL and FL combinations of 3 & 2, 2 & 3, 4 & 1.5, 1 & 6 *etc.* all give a DCL of 6.

Conclusion : The OL means that a part of the cost of the firm is fixed over a broad range of volume. As a consequence, the operating profits are boosted or depressed more than proportionately for a change in volume. Similarly, FL occurs when a firm's capital structure contains obligation with fixed financial charges. The effect of this condition is similar to that of OL. The EPS may be boosted or depressed more than proportionately as the operating volume changes. Both OL and FL may be present in a firm and the respective impact on the profits will tend to be mutually reinforcing. The concepts of OL, FL and CL are useful tools in the hands of financial managers. Their significance lies in the fact that the concept of leverage helps (*i*) in specifying and measuring the effect of change in sales volume on the earnings available to the shareholders and (*ii*) in establishing the relationship between the OL and the FL.

POINTS TO REMEMBER

- The total funds needed by a firm depends upon the investment decisions of the firm. However, the next step is to determine the best mix of different sources of funds. The process that leads to the choice of capital mix is often referred to as the capital structure planning.
- There are different techniques of analysing the risk-return characteristics of different alternative capital structures. The Leverage Analysis and EBIT-EPS Analysis are two such techniques.
- In Leverage Analysis, the relationship between two inter-related variables is established. In financial management, there are two types of leverages calculated. These are Operating leverage and Financial leverage. A Combined leverage may also be calculated.
- The Operating leverage establishes the relationship between sales and EBIT. It measures the effect of chance in sales revenue on the level of EBIT and is defined as :

$$\text{Operating leverage} = \frac{\%\text{ Change in EBIT}}{\%\text{ Change in Sales}}, \text{ or} = \frac{\text{Contribution}}{\text{EBIT}}$$

- OL appears as a result of fixed cost. If there is no fixed cost, there will be no OL.
- The Financial leverage measures the responsiveness of the EPS for a given change in EBIT and is defined as :

$$\text{Financial leverage} = \frac{\%\text{ Change in EPS}}{\%\text{ Change in EBIT}}, \text{ or} = \frac{\text{EBIT}}{\text{PBT}}$$

- In case of Preference Share Capital,

$$FL = \frac{\text{EBIT}}{\text{PBT} - \text{PD}/(1-t)}$$

- The financial leverage appears as a result of fixed financial charge *i.e.* interest and preference dividend.

- Combined leverage may also be ascertained to measures the % change in EPS for a % change in the Sales and may be defined as :

$$\text{Combined leverage} = \frac{\%\text{ Change in EPS}}{\%\text{ Change in Sales}}, \text{ or} = \frac{\text{Contribution}}{\text{PBT}}, \text{ or} = \text{OL} \times \text{FL}$$

- The concept of leverage can be used to analyse the risk level of the firm. The OL, FL and CL can be used to measure business, financial and total risk of the firm.

GRADED ILLUSTRATIONS

Illustration 6.1

Calculate the degree of operating leverage (DOL), degree of financial leverage (DFL) and the degree of combined leverage (DCL) for the following firms and interpret the results.

	Firm A	Firm B	Firm C
1. Output (Units)	60,000	15,000	1,00,000
2. Fixed costs (₹)	7,000	14,000	1,500
3. Variable cost per unit (₹)	0.20	1.50	0.02
4. Interest on borrowed funds (₹)	4,000	8,000	–
5. Selling price per unit (₹)	0.60	5.00	0.10

Solution :

	Firm A	Firm B	Firm C
Output (Units)	60,000	15,000	1,00,000
Selling Price per unit (₹)	0.60	5.00	0.10
Variable Cost per unit	0.20	1.50	0.02
Contribution per unit (₹)	0.40	3.50	0.08
Total Contribution	₹ 24,000	₹ 52,500	₹ 8,000
–Fixed Costs	7,000	14,000	1,500
EBIT	17,000	38,500	6,500
– Interest	4,000	8,000	—
Profit before Tax (P.B.T)	13,000	30,500	6,500

Degree of Operating Leverage

$$\frac{\text{Contribution}}{\text{EBIT}} = \frac{24,000}{17,000} \quad \frac{52,500}{38,000} \quad \frac{8,000}{6,500}$$

$$= 1.41 \quad = 1.36 \quad = 1.23$$

Degree of Financial Leverage

$$\frac{\text{EBIT}}{\text{PBT}} = \frac{17,000}{13,000} \quad \frac{38,500}{30,500} \quad \frac{6,500}{6,500}$$

$$= 1.31 \quad = 1.26 \quad = 1.00$$

Degree of Combined Leverage

$$\frac{\text{Contribution}}{\text{PBT}} = \frac{24,000}{13,000} \quad \frac{52,500}{30,500} \quad \frac{8,000}{6,500}$$

$$= 1.85 \quad = 1.72 \quad = 1.23$$

Interpretation : High operating leverage combined with high financial leverage represents risky situation. Low operating leverage combined with low financial leverage will constitute an ideal situation. Therefore, firm C is less risky because it has low fixed cost and no interest and consequently low combined leverage.

Illustration 6.2

A firm has sales of ₹ 10,00,000, variable cost of ₹ 7,00,000 and fixed costs of ₹ 2,00,000 and debt of ₹ 5,00,000 at 10% rate of interest. What are the operating, financial and combined leverages ? If the firm wants to double its earnings before interest and tax (EBIT), how much of a rise in sales would be needed on a percentage basis ?

Solution :

STATEMENT OF EXISTING PROFIT

Sales	₹ 10,00,000
–Variable Cost	7,00,000
Contribution	3,00,000
–Fixed Cost	2,00,000
EBIT	1,00,000
–Interest @ 10% on 5,00,000	50,000
Profit before tax (PBT)	50,000

$$\text{Operating Leverage} = \frac{\text{Contribution}}{\text{EBIT}} = \frac{3,00,000}{1,00,000} = 3$$

$$\text{Financial Leverage} = \frac{\text{EBIT}}{\text{PBT}} = \frac{1,00,000}{50,000} = 2$$

$$\text{Combined Leverage} = 3 \times 2 = 6$$

STATEMENT OF SALES NEEDED TO DOUBLE THE EBIT

Operating leverage is 3 times *i.e.,* $33\frac{1}{3}\%$ increase in sales volume causes a 100% increase in operating profit or EBIT. Thus, at the sales of ₹ 13,33,333, operating profit or EBIT will become ₹ 2,00,000 *i.e.,* double the existing one.

Verification

Sales	₹ 13,33,333
–Variable Cost (70%)	9,33,333
Contribution	4,00,000
–Fixed Costs	2,00,000
EBIT	2,00,000

Illustration 6.3

Following information are related to four firms of the same industry:

Firm	Change in Sales	Change in EBIT	Change in EPS
A	27%	25%	30%
B	25%	32%	24%
C	23%	36%	21%
D	21%	40%	23%

Calculate (i) Degree of OL & (ii) Degree of CL for all firms.

Solution :

Firm	Operating Leverage $OL = \frac{\%\text{ Change in EBIT}}{\%\text{ Change in Sales}}$	Combined Leverage $CL = \frac{\%\text{ Change in EPS}}{\%\text{ Change in Sales}}$
A	$OL = \frac{25}{27} = 0.926$	$CL = \frac{30}{27} = 1.111$
B	$OL = \frac{32}{25} = 1.280$	$CL = \frac{24}{25} = 0.960$
C	$OL = \frac{36}{23} = 1.565$	$CL = \frac{21}{23} = 0.913$
D	$OL = \frac{40}{21} = 1.905$	$CL = \frac{23}{21} = 1.095$

Illustration 6.4

X Corporation has estimated that for a new product its break-even point is 2,000 units if the item is sold for ₹ 14 per unit; the cost accounting department has currently identified variable cost of ₹ 9 per unit. Calculate the degree of operating leverage for sales volume of 2,500 units and 3,000 units. What do you infer from the degree of operating leverage at the sales volumes of 2,500 units and 3,000 units and their difference if any?

Solution:

STATEMENT OF OPERATING LEVERAGE

Particulars	2500 Units	3000 Units
Sales @ ₹ 14 per unit	35,000	42,000
Variable cost	22,500	27,000
Contribution	12,500	15,000
Fixed cost (2000 × (₹ 14–9))	10,000	10,000
EBIT	2,500	5,000
Operating Leverage = Contribution / EBIT =	12,500	15,000
	2,500	5,000
=	5	3

At the sales volume of 3000 units, the operating profit is ₹ 5,000 which is double the operating profit of ₹ 2,500 (sales volume of 2,500 units) because of the fact that the operating leverage is 5 times at the sales volume of 2,500 units. Hence increase of 20% in sales volume, the operating profit has increased by 100% *i.e.*, 5 times of 20%. At the level of 3000 units, the operating leverage is 3 times. If there is change in sales from the level of 3,000 units, the % increase in EBIT would be three times that of % increase in sales volume.

Illustration 6.5

The balance sheet of Well Established Company is as follows :

Liabilities	Amount	Assets	Amount
Equity Share Capital	₹ 60,000	Fixed assets	₹ 1,50,000
Retained Earnings	20,000	Current Assets	50,000
10% Long-term Debt	80,000		
Current Liabilities	40,000		
	2,00,000		2,00,000

The company's Total Assets turnover ratio is 3, its Fixed operating costs are ₹ 1,00,000 and its Variable operating cost ratio is 40%. The income tax rate is 30%. Calculate for the Company the different types of leverages given that the face value of the share is ₹ 10.

Solution :

$$\text{Total Assets Turnover Ratio} = \frac{\text{Sales}}{\text{Total Assets}}$$

$$3 = \frac{\text{Sales}}{2,00,000}$$

Sales	6,00,000
Variable Operating Cost (40%)	2,40,000
Contribution	3,60,000
– Fixed Operating Cost	1,00,000
EBIT	2,60,000
–Interest (10% of 80,000)	8,000
PBT	2,52,000
Tax at 30%	75,600
PAT	1,76,400
Number of shares	6,000
EPS	29.40

$$\text{Degree of Operating Leverage} = \text{Contribution/EBIT} = \frac{3,60,000}{2,60,000} = 1.38$$

$$\text{Degree of Financial Leverage} = \text{EBIT/PBT} = \frac{2,60,000}{2,52,000} = 1.03$$

$$\text{Degree of Combined Leverage} = 1.38 \times 1.03 = 1.42$$

Note : *In this question, the operating leverage, financial leverage and the combined leverage are to be calculated for which the detailed income statement is required. Therefore, the sales level, as a first step, is calculated with the help of Total Assets Turnover Ratio.*

Illustration 6.6

The following information is available in respect of two firms, P Ltd. and Q Ltd. :

(Figures in ₹ Lacs)

	P Ltd.	Q Ltd.
Sales	500	1000
–Variable Cost	200	300
Contribution	300	700
–Fixed Cost	150	400
EBIT	150	300
–Interest	50	100
Profit before Tax	100	200

You are required to calculate different leverages for both the firms and also comment on their relative risk position.

Solution :

Calculation of different leverages (P Ltd.):

Operating Leverage = Contribution/EBIT = ₹ 300 lacs/₹ 150 lacs
= 2

Financial Leverage = EBIT/Profit before Tax= ₹ 150 lacs/₹ 100 lacs
= 1.5

Combined Leverage = Contribution/Profit before tax = OL × FL
= 3

Calculation of different leverages (Q Ltd.):

Operating Leverage = Contribution/EBIT = ₹ 700 lacs/₹ 300 lacs
= 2.33

Financial Leverage = EBIT/Profit before Tax= ₹ 300 lacs/₹ 200 lacs
= 1.5

Combined Leverage = Contribution/Profit before tax = OL × FL
= 3.5

The operating leverage is higher in case of Q Ltd. and hence it has higher degree of operating or business risk. However, both the companies have same degree of financial leverage. Hence, both the firms have same financial risk. The combined leverage of Q Ltd. is 3.5 and is higher than P Ltd. Therefore, on the whole P Ltd. seems to be having lower risk as compared to Q Ltd.

Illustration 6.7

The Karnal Recreation Ltd. manufactures a full line of lawn furniture. The average selling price of a finished unit is ₹ 2,500 and variable cost is ₹ 1,500 per unit. Fixed cost for the company is ₹ 50,00,000 per year.

(*i*) What is break-even point in units for the company?

(*ii*) Find the degree of operating leverage at the following production and sales levels : 4,000 units; 5,000 units; 6,000 units; 8,000 units.

(*iii*) Does the degree of operating leverage increase or decrease as the production and sales levels rise above the break-even point? What conclusion would you draw from such increase or decrease?

(*iv*) By what percentage the EBIT will increase if the company's sales should increase by 10% from the production and sales level of 8,000 units?

[B.Com. (H.), D.U., 2010]

Solution :

Calculation of Operating Leverages:

Production (No. of Units)	4,000	5,000	6,000	8,000	8,800
Selling Price (₹)	2,500	2,500	2,500	2,500	2,500
Sales (₹)	100,00,000	125,00,000	150,00,000	200,00,000	220,00,000
– Variable Cost @ ₹ 1,500	60,00,000	75,00,000	90,00,000	120,00,000	132,00,000
Contribution	40,00,000	50,00,000	60,00,000	80,00,000	88,00,000
– Fixed Cost	50,00,000	50,00,000	50,00,000	50,00,000	50,00,000
EBIT	-10,00,000	—	10,00,000	30,00,000	38,00,000
OL (Contribution ÷ FC)	—	—	6.000	2.667	2.316

Break-even level (Units) = FC/(SP – VC)
= 50,00,000/(2500 – 1500)
= 5,000

When the sales level rises above the break-even level, the OL decreases. This means that when the sales increases beyond the break-even level, the increase in operating profits (EBIT) is lesser and lesser.

In case the sales increases by 10% from 8000 level, the EBIT would increase by 10 × 2.667 = 26.67%. This can be verified in the table. The EBIT increases by ₹ 8,00,000 from ₹ 30,00,000 to ₹ 38,00,000 *i.e.,* 26.67%.

Illustration 6.8

The capital structure of Radhika Ltd. consists of ordinary share capital of ₹ 10,00,000 (shares of ₹ 100 each) and ₹ 10,00,000 of 10% debentures. The selling price is ₹ 10 per unit; variable costs amount to ₹ 6 per unit and fixed expenses amount to ₹ 2,00,000. The income tax rate is assumed to be 30%. The sales level is expected to increase from 1,00,000 units to 1,20,000 units.

(*a*) You are required to calculate :

(*i*) The percentage increase in earnings per share;

(*ii*) The degree of financial leverage at 1,00,000 units and 1,20,000 units.

(*iii*) The degree of Operating leverage at 1,00,000 units and 1,20,000 units.

(*b*) Comment on the behaviour of Operating and Financial leverages in relation to increase in production from 1,00,000 units to 1,20,000 units.

[B.Com. (H.), D.U., 2011]

Solution :

(*a*) **Comparative Statement of EPS, Financial & Operating Leverages**

Particulars	1,00,000 units	1,20,000 units
Sales at ₹ 10 per unit	₹ 10,00,000	₹ 12,00,000
– Variable costs at ₹ 6 per unit	6,00,000	7,20,000
Contribution	4,00,000	4,80,000
– Fixed Expenses	2,00,000	2,00,000
EBIT	2,00,000	2,80,000
–Interest on Debentures	1,00,000	1,00,000
Profit before tax	1,00,000	1,80,000
–Tax at 30%	30,000	54,000
Profit after tax	70,000	1,26,000
(*i*) EPS (10,000 shares)	70,000	1,26,000
	10,000	10,000
	7,00	12.60
% increase in EPS		80%
(*ii*) Degree of Financial Leverage	2,00,000	2,80,000
	1,00,000	1,80,000
	2	1.56
(*iii*) Degree of Operating Leverage	4,00,000	4,80,000
	2,00,000	2,80,000
	2	1.71

(*b*) As a result of increase in sales from 1,00,000 units to 1,20,000 units (20% increase), both the financial leverage and operating leverage have decreased. This signify that the business risk and financial risk of the business are reduced.

Illustration 6.9

The data relating to two companies are as given below :

	Company A	Company B
Capital	₹ 6,00,000	₹ 3,50,000
12% Debentures	₹ 4,00,000	₹ 6,50,000
Output (units) per annum	60,000	15,000
Selling price/unit	₹ 30	₹ 250
Fixed Costs per annum	₹ 7,00,000	₹ 14,00,000
Variable Cost per unit	₹ 10	₹ 75

You are required to calculate the Operating leverage, Financial leverage and Combined leverage of two Companies.

Solution :

COMPUTATION OF OPERATING LEVERAGE, FINANCIAL LEVERAGE AND COMBINED LEVERAGE

	Company A	Company B
Output (units per annum)	60,000	15,000
Selling price per unit	₹ 30	₹ 250
Sales revenue	₹ 18,00,000	₹ 37,50,000
Less : Variable costs @ ₹ 10 and ₹ 75	6,00,000	11,25,000
Contribution	12,00,000	26,25,000
Less : Fixed costs	7,00,000	14,00,000
EBIT	5,00,000	12,25,000
Less : Interest @ 12% on Debentures	48,000	78,000
PBT	4,52,000	11,47,000
$\text{DOL} = \frac{\text{Cont.}}{\text{EBIT}}$	(₹ 12,00,000/₹ 5,00,000)	(₹ 26,25,000/₹ 12,25,000)
	2.4	2.14
$\text{DFL} = \frac{\text{EBIT}}{\text{PBT}}$	(₹ 5,00,000/₹ 4,52,000)	(₹ 12,25,000/₹ 11,47,000)
	1.11	1.07
DCL = DOL×DFL	(2.4 × 1.11) = 2.66	(2.14 × 1.07) = 2.29

Illustration 6.10

The following information is available for ABC & Co.

EBIT	₹ 11,20,000
Profit before Tax	3,20,000
Fixed costs	7,00,000

Calculate % change in EPS if the sales are expected to increase by 5%.

Solution :

In order to find out the % change in EPS as a result of % change in sales, the combined leverage should be calculated as follows :

Operating Leverage = Contribution/EBIT
= ₹ 11,20,000 + ₹ 7,00,000/11,20,000
= 1.625

Financial Leverage = EBIT/Profit before Tax
= ₹ 11,20,000/3,20,000
= 3.5

Combined Leverage = Contribution/Profit before Tax = OL × FL
= 1.625 × 3.5 = 5.69.

The combined leverage of 5.69 implies that for 1% change in sales level, the % change in EPS would be 5.69%. So, if the sales are expected to increase by 5%, then the % increase in EPS would be 5 × 5.69 = 28.45%.

Illustration 6.11

XYZ & Co. has three financial plans before it, Plan I, Plan II and Plan III. Calculate operating and financial leverage for the firm on the basis of the following information and also find out the highest and lowest value of combined leverage:

Production		800 Units
Selling Price per unit		₹ 15
Variable cost per unit		₹ 10
Fixed cost:	Situation A	₹ 1,000
	Situation B	₹ 2,000
	Situation C	₹ 3,000

Capital Structure	Plan I	Plan II	Plan III
Equity Capital	₹ 5,000	₹ 7,500	₹ 2,500
12% Debt	5,000	2,500	7,500

Solution :

Calculation of Operating Leverage:

	Situation A	Situation B	Situation C
Number of unit sold	800	800	800
Sales @ ₹ 15	12,000	12,000	12,000
Variable cost @ ₹ 10	8,000	8,000	8,000
Contribution	4,000	4,000	4,000
Fixed cost	1,000	2,000	3,000
EBIT	3,000	2,000	1,000
Operating Leverage (Contribution/EBIT)	1.33	2.00	4.00

Calculation of Financial Leverage :

	Plan I	Plan II	Plan III
Situation A			
EBIT	₹ 3,000	₹ 3,000	₹ 3,000
–Interest @ 12%	600	300	900
Profit before Tax	2,400	2,700	2,100
Financial Leverage (EBIT/Profit before Tax)	1.25	1.11	1.43
Situation B			
EBIT	₹ 2,000	₹ 2,000	₹ 2,000
–Interest @ 12%	600	300	900
Profit before Tax	1,400	1,700	1,100
Financial Leverage (EBIT/Profit before Tax)	1.43	1.18	1.82
Situation C			
EBIT	₹ 1,000	₹ 1,000	₹ 1,000
–Interest @ 12%	600	300	900
Profit before Tax	400	700	100
Financial Leverage (EBIT/Profit before Tax)	2.5	1.43	10.0

Calculation of Combined Leverage : The combined leverage may be calculated by multiplying the operating leverage and financial leverage for different combination of Situation A, B & C and the Financial Plans I, II & III as follows :

	Situation A	Situation B	Situation C
Plan I	1.66	2.86	10
Plan II	1.47	2.36	5.72
Plan III	1.90	3.64	40

The calculation of combined leverage shows the extent of the total risk and is helpful to understand the variability of EPS as a consequence of change in sales levels. In this case, the highest combined leverages is there when Financial Plan III is implemented in situation C; and lowest value of combined leverage is attained when Financial Plan II is implemented in situation A.

Illustration 6.12

The share capital of a company is ₹ 10,00,000 with shares of face value of ₹ 10. The company has debt capital of ₹ 6,00,000 at 10% rate of interest. The sales of the firm are 3,00,000 units per annum at a selling price of ₹ 5 per unit and the variable cost is ₹ 3 per unit. The fixed cost amounts to ₹ 2,00,000. The company pays tax at 35%. If the sales increase by 10%, calculate:

(*i*) Percentage Increase in EPS ;

(*ii*) Degree of Operating Leverage at the two levels ; and

(*iii*) Degree of Financial Leverage at the two levels.

Solution:

	Existing	Expected
Sales (in units)	3,00,000	3,30,000
Sales @ 5/-	₹ 15,00,000	₹ 16,50,000
Variable Cost at 3/-	9,00,000	9,90,000
Contribution	6,00,000	6,60,000
Fixed cost	2,00,000	2,00,000

	Existing	Expected
Operating Profit (EBIT)	4,00,000	4,60,000
Less : Interest on debt at 10%	60,000	60,000
Profit Before Tax	3,40,000	4,00,000
Less : Tax @ 35%	1,19,000	1,40,000
Net Profit after tax	2,21,000	2,60,000

Increase in EPS :

$$\text{Existing EPS} = \frac{\text{Net Profit}}{\text{No. of Shares}} \quad \frac{2,21,000}{1,10,000} = ₹\ 2.21$$

$$\text{Expected EPS} = \frac{2,60,000}{1,00,000} = ₹\ 2.60$$

$$\text{Percentage increase in EPS} = \frac{0.39}{2.21} = 17.65\%$$

Operating Leverage:

$$\text{Existing OL} = \frac{\text{Contribution}}{\text{EBIT}} = \frac{6,00,000}{4,00,000} = 1.5$$

$$\text{Expected OL} = \frac{6,60,000}{4,60,000} = 1.43$$

Financial Leverage:

$$\text{Existing FL} = \frac{\text{EBIT}}{\text{PBT}} \quad \frac{4,00,000}{3,40,000} = 1.176$$

$$\text{Expected FL} = \frac{4,60,000}{4,00,000} = 1.150$$

Illustration 6.13

Following information is available in respect of Som Dut Bearings Ltd.:

Profit Volume (PV) Ratio	40%
Operating Leverage	1.5000
Financial Leverage	1.421
Interest Liability	₹ 8,000
Tax rate	30%
No. of Equity Shares	10,000

Prepare the income statement and find out EPS.

Solution:

$$\text{FL} = \frac{\text{EBIT}}{\text{PBT}} = \frac{\text{EBIT}}{\text{EBIT–Interest}} = \frac{\text{EBIT}}{\text{EBIT} - 8000}$$

$$1.421 = \frac{\text{EBIT}}{\text{EBIT} - 8000}$$

So, EBIT = 27,000

PBT = 27,000 – 8,000 = ₹ 19,000

$$\text{OL} = \frac{\text{Contribution}}{\text{EBIT}} = \frac{\text{Contribution}}{₹\ 27,000}$$

$$1.5 = \frac{\text{Contribution}}{₹\ 27,000}$$

So, Contribution = ₹ 40,500

Fixed Cost = ₹ 40,500 – 27,000 = ₹ 13,500

PV Ratio = 40%, and Contribution = ₹ 40,500

So, Sales = Contribution ÷ PV Ratio

= ₹ 40,500 ÷ .40 = ₹ 1,01,250

Variable Cost = ₹ 1,01,250 × .60 = ₹ 60,750

EPS of the Company can be calculated as follows:

Sales	₹ 1,01,250
–Variable Cost	60,750
Contribution	40,500
– Fixed Cost	13,500
EBIT	27,000
– Interest	8,000
PBT	19,000
– Tax @ 30%	5,700
	13,300
No. of Equity Shares	10,000
EPS (13,300 ÷ 10,000)	1.33

Illustration 6.14

The following data is available for XYZ Ltd.:

Sales	₹ 2,00,000
–Variable cost @ 30%	60,000
Contribution	1,40,000
Fixed cost	1,00,000
EBIT	40,000
–Interest	5,000
Profit before tax	35,000

Find out:

(*i*) Using the concept of financial leverage, by what percentage will the taxable income increase if EBIT increases by 6%.

(*ii*) Using the concept of operating leverage, by what percentage will EBIT increase if there is 10% increase in sales, and

(*iii*) Using the concept of leverage, by what percentage will the taxable income increase if the sales increase by 6%. Also verify the results in view of the above figures.

Solution :

(*i*) **Degree of Financial leverage :**

FL = EBIT/Profit before Tax = 40,000/35,000

= 1.15

If EBIT increases by 6%, the taxable income will increase by 1.15 × 6 = 6.9% and it may be verified as follows:

EBIT (after 6% increase)	₹ 42,400
–Interest	5,000
Profit before Tax	37,400

Increase in taxable income is ₹ 2,400 *i.e.,* 6.9% of ₹ 35,000.

(*ii*) **Degree of Operating leverage :**

OL = Contribution/EBIT = 1,40,000/40,000

= 3.50

If sale increases by 10%, the EBIT will increase by 3.50×10 =35% and it may be verified as follows:

Sales (after 10% increase)	₹ 2,20,000
–Variable Expenses @ 30%	66,000
Contribution	1,54,000
–Fixed cost	1,00,000
EBIT	54,000

Increase in EBIT is ₹ 14,000 *i.e.,* 35% of ₹ 40,000.

(*iii*) **Degree of Combined leverage :**

CL = Contribution/Profit before Tax = 1,40,000/35,000 = 4

If sales increases by 6%, the profit before tax will increase by 4×6 =24% and it may be verified as follows :

Sales (after 6% increase)	₹ 2,12,000
–Variable Expenses @ 30%	63,600
Contribution	1,48,400
–Fixed cost	1,00,000
EBIT	48,400
–Interest	5,000
Profit before Tax	43,400

Increase in Profit before tax is ₹ 8,400 *i.e.,* 24% of ₹ 35,000.

Illustration 6.15

(*i*) **Find out Operating Leverage from the following data:**

Sales	₹ 50,000
Variable Costs	60%
Fixed Costs	₹ 12,000

(*ii*) **Find out the Financial Leverage from the following data:**

Net Worth	₹ 25,00,000
Debt/Equity	3:1
Interest rate	12%
Operating Profit	₹ 20,00,000

Solution :

(*i*)

Sales	₹ 50,000
–Variable cost at 60%	30,000
Contribution	20,000
–Fixed Cost	12,000
Operating profit	₹ 8,000

$$\text{Operating Leverage} = \frac{\text{Contribution}}{\text{Operating Profit}} = \frac{20,000}{8,000} = 2.50$$

(*ii*)

Net Worth	₹ 25,00,000
Debt/Equity	3 : 1
Hence Debt	₹ 75,00,000
EBIT	20,00,000
–Interest at 12% on 75,00,000	9,00,000
PBT	11,00,000

$$\text{Financial Leverage} = \frac{\text{EBIT}}{\text{PBT}} = \frac{20,00,000}{11,00,000} = 1.82$$

Illustration 6.16

The following are details of Bankers Ltd. for the year ending 31.03.2015.

Operating Leverage	3
Financial Leverage	2
Interest charge per annum	₹ 20 Lakhs
Corporate Tax Rate	50%
Variable Cost as percentage of sales	60%

Prepare Income Statement of the Company.

[B.Com.(H.) D.U., 2013]

Solution:

Calculation of EBIT:

Financial Leverage	=	2 (Given)
Interest	=	₹ 20,00,000
Now, FL	=	$\frac{\text{EBIT}}{\text{PBT}} = \frac{\text{EBIT}}{\text{EBIT– Int.}}$
	=	$\frac{\text{EBIT}}{\text{EBIT – 20,00,000}}$
EBIT	=	₹40,00,000

Calculation of Contribution:

Operating Leverage	=	3 (Given)
EBIT	=	₹40,00,000
OL		$\frac{\text{Contribution}}{\text{EBIT}}$
So, Contribution	=	₹120,00,000
Now, Fixed cost	= Contribution–EBIT	
	=₹120,00,000–40,00,000	
	= ₹80,00,000	

Calculation of Sales:

% Variable Cost	=	60%
So, Contribution	=	40%
Contribution	=	₹120,00,000
So, Sales (₹1,20,00,000 ÷ 40)	=	₹300,00,000

Now, the Income Statement can be prepared as follows :

Sales	₹300,00,000
Less: Variable Cost (60%)	180,00,000
Contribution	120,00,000
Less : Fixed Cost	80,00,000
EBIT	40,00,000
Less : Interest	20,00,000
Profit Before Tax	20,00,000
–Tax @ 50%	10,00,000
Profit After Tax	10,00,000

OBJECTIVE TYPE QUESTIONS

State whether each of the following statements is ***True (T)*** *or* ***False (F).***

(*i*) Operating leverage analyses the relationship between sales level and EPS.

(*ii*) Financial leverage depends upon the operating leverage.

(*iii*) Dividend on Pref. shares is a factor of operating leverage.

(*iv*) Operating leverage may be defined as Contribution ÷ EPS.

(*v*) Financial leverage depends upon the fixed financial charges.

(*vi*) Favourable financial leverage and trading on equity are same.

(*vii*) Combined leverage establishes the relationship between operating leverage and financial leverage.

(*viii*) Financial leverage is always beneficial to the firm.

(*ix*) Total risk of a firm is determined by the combined effect of operating and financial leverages.

(*x*) Combined leverage helps in analysing the effect of change in sales level on the EPS of the firm.

[**Answers :** (*i*) F, (*ii*) F, (*iii*) F, (*iv*) F, (*v*) T, (*vi*) T, (*vii*) F, (*viii*) F, (*ix*) T, (*x*) T.]

MULTIPLE CHOICE QUESTIONS

1. Operating leverage helps in analysis of:
- (*a*) Business Risk
- (*b*) Financing Risk
- (*c*) Production Risk
- (*d*) Credit Risk

2. Which of the following is studied with the help of financial leverage?
- (*a*) Marketing Risk
- (*b*) Interest Rate Risk
- (*c*) Foreign Exchange Risk
- (*d*) Financing risk

3. Combined Leverage is obtained from OL and FL by their:
- (*a*) Addition
- (*b*) Subtraction
- (*c*) Multiplication
- (*d*) Any of these

4. High degree of financial leverage means:
- (*a*) High debt proportion
- (*b*) Lower debt proportion
- (*c*) Equal debt & equity
- (*d*) No debt

5. Operating leverage arises because of:
- (*a*) Fixed Cost of Production
- (*b*) Fixed Interest Cost
- (*c*) Variable Cost
- (*d*) None of the above

6. Financial Leverage arises because of:
- (*a*) Fixed cost of production
- (*b*) Variable Cost
- (*c*) Interest Cost
- (*d*) None of the above

7. Operating Leverage is calculated as :
- (*a*) Contribution ÷ EBIT
- (*b*) EBIT ÷ PBT
- (*c*) EBIT ÷ Interest
- (*d*) EBIT ÷ Tax

8. Financial Leverage is calculated as :
- (*a*) EBIT ÷ Contribution
- (*b*) EBIT ÷ PBT
- (*c*) EBIT ÷ Sales
- (*d*) EBIT ÷ Variable Cost

9. Which combination is generally good for a firm?
- (*a*) High OL, High FL
- (*b*) Low OL, Low FL
- (*c*) High OL, Low FL
- (*d*) None of these

10. Combined leverage can be used to measure the relationship between :
- (*a*) EBIT and EPS
- (*b*) PAT and EPS
- (*c*) Sales and EPS
- (*d*) Sales and EBIT

11. FL is zero if:
- (*a*) EBIT = Interest
- (*b*) EBIT = Zero
- (*c*) EBIT = Fixed Cost
- (*d*) EBIT = Pref. Dividend

12. Business Risk can be measured by:
- (*a*) Financial leverage
- (*b*) Operating leverage
- (*c*) Combined leverage
- (*d*) None of the above

13. Financial Leverage measures relationship between:
- (*a*) EBIT and PBT
- (*b*) EBIT and EPS
- (*c*) Sales and PBT
- (*d*) Sales and EPS

14. Use of Preference Share Capital in Capital structure:
- (*a*) Increases OL
- (*b*) Increases FL
- (*c*) Decreases OL
- (*d*) Decreases FL

15. Relationship between change in sales and change in EPS is measured by:
- (*a*) Financial leverage
- (*b*) Combined leverage
- (*c*) Operating leverage
- (*d*) None of the above

16. Operating leverage works when:
- (*a*) Sales Increases

(*b*) Sales Decreases
(*c*) Both (*a*) and (*b*)
(*d*) None of (*a*) and (*b*)

17. Which of the following is correct?
(*a*) CL = OL + FL
(*b*) CL = OL – FL
(*c*) OL = OL × FL
(*d*) OL = OL ÷ FL

18. If the fixed cost of production is zero, which one of the following is correct?
(*a*) OL is zero
(*b*) FL is zero
(*c*) CL is zero
(*d*) None of the above

19. If a firm has no debt, which one is correct?
(*a*) OL is one
(*b*) FL is one
(*c*) OL is zero
(*d*) FL is zero

20. If a company issues new share capital to redeem debentures, then:
(*a*) OL will increase
(*b*) FL will increase
(*c*) OL will decrease
(*d*) FL will decrease

21. If a firm has a DOL of 2.8, it means :
(*a*) If Sales increase by 2.8%, the EBIT will increase by 1%
(*b*) If EBIT increase by 2.8%, the EPS will increase by 1%
(*c*) If Sales rise by 1%, EBIT will rise by 2.8%
(*d*) None of the above

22. Higher OL is related to the use of higher :
(*a*) Debt
(*b*) Equity
(*c*) Fixed Cost
(*d*) Variable Cost

23. Higher FL is related the use of :
(*a*) Higher Equity
(*b*) Higher Debt
(*c*) Lower Debt
(*d*) None of the above

[**Answers :** *1. (a), 2. (d), 3. (c), 4. (a), 5. (a), 6. (c), 7. (a), 8. (b), 9. (c), 10. (c), 11. (b), 12. (b), 13. (b), 14. (b), 15. (b), 16. (c), 17. (c), 18. (d), 19. (b), 20. (d), 21. (c), 22. (c), 23. (b)*]

ASSIGNMENTS

1. Write short notes on
(*a*) Fixed Financial Costs.
(*b*) Combined Leverage.

2. What do you mean by leverage? Why is increasing leverage indicative of increasing risk?

3. Differentiate between the business risk and financing risk of a firm. How are they measured by the leverage? *[B.Com.(H.), D.U., 2005, 2006, 2008, 2012]*

4. Distinguish between operating leverage and financial leverage. How the two leverages can be measured? *[B.Com.(H.), D.U. 2007]*

5. Explain the concept of financial leverage. Examine the impact of financial leverage on the EPS. Does the financial leverage always increases the EPS?

6. Why must the finance manager keep in mind the degree of FL in evaluating various financial plans ? When FL becomes favourable? *[B.Com.(H.), D.U. 2004, 2013]*

7. What is combined leverage? Examine its significance in financial planning of a firm.

8. Which combination of the operating and financial leverages constitutes (*i*) risky situation and (*ii*) ideal situation.

9. Is it true that a firm with high degree of OL should have high degree of FL ? Examine. *[B.Com. (H.) D.U., 2014]*

10. The purpose of measuring operating leverage is different from that of financial leverage. Explain *[B.Com.(H.) D.U., 2009]*

11. What does combined leverage measure? What should be the changes in the degree of combined leverage in each of following situations:
(*a*) The fixed cost increases.
(*b*) The sale price decreases. *[B.Com.(H.), D.U., 2010]*

12. What are various factors which affect business and financial risk of a firm? Differentiate between the two. *[B.Com.(H.) D.U., 2015]*

PROBLEMS

P6.1 The following figures relate to two companies:

	(In ₹ lacs)	
	P LTD.	**Q LTD.**
Sales	750	1,000
Variable Cost	300	300
Contribution	450	700
Fixed costs	225	400
EBIT	225	300
–Interest	75	100
Profit before Tax	150	200

You are required to:

(*i*) Calculate the Operating, Financial and Combined leverages for the two companies; and

(*ii*) Comment on the relative risk position of them.

[*Answer :* OL = 2 and 2.33; FL = 1.5 and 1.5.]

P6.2 A firm has sales of ₹ 20,00,000, Variable costs of ₹ 14,00,000 and Fixed costs of ₹ 4,00,000 inclusive of interest of ₹ 1,00,000.

(*i*) Calculate its Operating, Financial and Combined leverages.

(*ii*) If the firm decides to double its EBIT, how much of a rise in sales would be needed on a percentage basis?

[*Answer :* Operating leverage is 2. So, 50% increase in sales is required for 100% increase in EBIT.]

P6.3 XYZ Ltd. has an average selling price of ₹ 10 per unit. Its variable unit costs are ₹ 7, and fixed costs amount to ₹ 1,70,000. It finances all its assets by equity funds. It pays 30% tax on its income. ABC Ltd. is identical to XYZ Ltd. except in respect of the pattern of financing. The latter finances its assets 50% by equity and 50% by debt, the interest on which amounts to ₹ 20,000. Determine the degree of operating, financial and combined leverages at ₹ 7,00,000 sales for both the firms, and interpret the results.

[*Answer :* Combined leverage of the two firms are 5.25 and 10.5.]

P6.4 The following is the income statement of XYZ Ltd. for the year 2000 :

Sales	₹ 50 lacs
–Variable cost	10 lacs
–Fixed cost	20 lacs
EBIT	20 lacs
–Interest	5 lacs
Profit before tax	15 lacs
–Tax at 40%	6 lacs
Profit after tax	9 lacs
–Preference dividend	1 lac
Profit for equity shareholder	8 lacs

The company has 4 lacs equity shares issued to the shareholders. Find out the degree of (*i*) Operating leverage, (*ii*) Financial Leverage, and (*iii*) Combined leverage. What would be the EPS if the sales level increases by 10%.

[*Answer :* The different leverages are 2, 1.5 and 3. The new EPS would be 30% higher at ₹ 2.60.]

6.5 ABC Ltd. is selling its products at ₹ 2 per unit. The variable cost of manufacturing has been estimated at 35% while the fixed cost at the present sales level of 1,00,000 units comes to ₹ 1,00,000. The firm has issued 14% debentures of ₹ 26,000. Find out the Operating, Financial and Combined leverage for the firm.

[**Answer :** OL = 4.33, FL=1.14 and CL=4.93]

P6.6 The ABC Co. has the following Balance Sheet and Income statement:

BALANCE SHEET

Liabilities	Amount	Assets	Amount
Equity capital (₹ 10 per share)	₹ 8,00,000	Fixed assets	₹ 10,00,000
Retained earnings	3,50,000	Current assets	9,00,000
10% Debt	6,00,000		
Current liabilities	1,50,000		
	19,00,000		19,00,000

INCOME STATEMENT

Sales	₹ 3,40,000
–Operating Expenses (including Dep.)	1,20,000
EBIT	2,20,000
–Interest	60,000
Profit before Tax	1,60,000
–Tax @ 30%	48,000
Profit after Tax	1,12,000

(*i*) Determine the OL, FL and CL at the current sales level given that all operating expenses (excluding depreciation of ₹ 52,000) are variable, and

(*ii*) If total assets remaining at the same level but (*a*) sales increasing by 20% and (*b*) sales decreasing by 20%, what will be the EPS?

[**Answer :** (*i*) 1.23,1.38 and 1.70; (*ii*) EPS under new situations would be ₹ 1.88, and ₹ 1.16 respectively.]

P6.7 A firm sells its product at ₹ 10 per unit. Its variable cost ratio is 70% while fixed cost are ₹ 10,000. Present sales are 10,000 units. You are required to calculate :

(*i*) Degree of Operating Leverage.

(*ii*) New EBIT if sales increased by 40%.

(*iii*) New EBIT if sales falls by 25%.

(*iv*) By what % should sales fall before the firm starts incurring loss. *[B.Com. (H.), D.U., 2013]*

[**Answer :** OL is 1.5; New EBIT = ₹ 32,000; New EBIT ₹ 12,500; EBIT should fall by 100%].

CHAPTER

7

Financing Decision : EBIT-EPS Analysis

"In making managerial decisions, firms pay close attention to the impact of decision on reported EPS. This concern with EPS is quite proper, for EPS is an important measure of the firm's performance and is closely monitored by the investors. Since EBIT is uncertain, the EPS is also uncertain, so, a firm cannot simply pick the plan with the highest EPS. One plan may provide more EPS at one level of EBIT but less at another. One way to formulate an EPS rule would be to pick the plan with the highest EPS at next year's expected (most likely) level of EBIT. Does EPS rule always favour debt? In most cases, it does. If we analyse the behaviour of EPS in response to changes in leverage, we will discover an interesting relationship."[1]

SYNOPSIS

- EBIT-EPS Analysis : An Introduction.
- Constant EBIT with Different Financing Patterns.
- Varying EBIT with Different Financing Patterns.
- Financial Break-even Level.
- Indifference Point/Level of EBIT.
- Graded Illustrations in EBIT-EPS Analysis.

1. Soloman, Ezra and Pringle, J.J., *An Introduction to Financial Management,* Prentice Hall of India (P) Ltd., Indian Reprint, p. 448.

In the previous chapter, the impact of the change in sales and interest liability on the change in EPS was analyzed. There is another way to analyze the impact of leverage on the return available to the shareholders. Given a particular level of EBIT, what will be the level of return available to shareholders under varying conditions of financing ? There may be different firms which are operating under similar conditions and having same level of EBIT and are alike in all respects excepts the pattern of financing. Whether, these firms will have same return for the shareholders. This analysis of the effect of different patterns of financing or the financial leverage on the level of returns available to the shareholders, under different assumptions of EBIT is known as EBIT-EPS analysis. The present chapter attempts to analyze the EBIT-EPS relationship under varying conditions and assumptions.

Given a level of EBIT, a particular combination of different sources of finance will result in a particular EPS and therefore, for different financing patterns, there would be different levels of EPS. Moreover, the EBIT level may also change due to one or the other reason. Thus, an interaction between the varying levels of EBIT and the financing patterns can affect the EPS in more than one ways. This and other implications of the financing patterns can be studied as EBIT-EPS analysis under two cases as follows :

CONSTANT EBIT AND CHANGE IN THE FINANCING PATTERNS : Holding the EBIT constant while varying the financial leverage or financing patterns, one can imagine the firm increasing its leverage by issuing bonds and using the proceeds to redeem the capital, or doing the opposite to reduce leverage. In practice, firms do not vary their leverage in this way. Usually the proceeds of new issue (of debts) are invested in assets rather than using to retire other capital liabilities. The effect on the EPS of a change in leverage while holding the EBIT constant, has been analyzed in the following discussion.

Suppose, ABC Ltd. which is expecting the EBIT of ₹ 1,50,000 per annum on an investment ₹ 5,00,000, is considering the finalization of the capital structure or the financial plan. The company has access to raise funds of varying amounts by issuing equity share capital, 12% preference share and 10% debenture or any combination thereof. Suppose, it analyzes the following four options to raise the required funds of ₹ 5,00,000.

1. By issuing equity share capital at par.
2. 50% funds by equity share capital and 50% funds by preference shares.
3. 50% funds by equity share capital, 25% by preference shares and 25% by issue of 10% debentures.
4. 25% funds by equity share capital, 25% as preference share and 50% by the issue of 10% debentures.

Assuming that ABC Ltd. belongs to 30% tax bracket, the EPS under the above four options can be calculated as follows :

	Option 1	Option 2	Option 3	Option 4
Equity share capital	₹ 5,00,000	₹ 2,50,000	₹ 2,50,000	₹ 1,25,000
Preference share capital	—	2,50,000	1,25,000	1,25,000
10% Debentures	—	—	1,25,000	2,50,000
Total Funds	5,00,000	5,00,000	5,00,000	5,00,000
EBIT	1,50,000	1,50,000	1,50,000	1,50,000
– Interest	—	—	12,500	25,000
Profit before Tax	1,50,000	1,50,000	1,37,500	1,25,000
– Tax @ 30%	45,000	45,000	41,250	37,500
Profit after Tax	1,05,000	1,05,000	96,250	87,500
– Preference Dividend	—	30,000	15,000	15,000
Profit for Equity shares	1,05,000	75,000	81,250	72,500
No. of Equity shares (of ₹ 100 each)	5000	2500	2500	1250
EPS (₹)	21.00	30.00	32.50	58.00

In this case, the financial plan under option 4 seems to be the best as it is giving the highest EPS of ₹ 58. In this plan, the firm has applied maximum financial leverage and the results are evident. The firm is expecting to earn an EBIT of ₹ 1,50,000 on the total investment of ₹ 5,00,000 resulting in 30% return. On an after tax basis, this return comes to 21% *i.e.*, 30% × (1 – .3). However, the after tax cost of 10% debentures is 7% *i.e.*, 10% (1 – .3) and the after tax cost of preference shares is 12% only. In the option 4, the firm has employed 50% debt, 25% preference shares and 25% equity share capital, and the benefits of employing 50% debt (which has after tax cost of 7% only) and 25% preference shares (having cost of 12% only) are extended to the equity shareholders. Therefore the firm is expecting an EPS of ₹ 58.

In case, the company opts for all-equity financing only, the EPS is ₹ 21 which is just equal to the after tax return on investment. However, in option 2, where 50% funds are obtained by the issue of 12% preference shares, the 9% extra is available to the equity shareholders resulting in increase of EPS from ₹ 21 to ₹ 30. In plan 3, where 10% debt is also introduced, the extra benefit accruing to the equity shareholders increases further (from preference shares as well as from debt) and the EPS further increases to ₹ 32.50. This gradual increase in EPS in different plans from ₹ 21 to ₹ 30 and then to ₹ 32.50 and ultimately to ₹ 58 is not without reasons. The company is expecting this increase in EPS when more and more preference share and debt financing is availed because the after tax cost of preference shares and deben-

tures are less than the after tax return on total investment. What happens if the return on investment (EBIT as a % of funds employed) is reduced from 30% to 18% ? The results are shown in the following table :

	Option 1	Option 2	Option 3	Option 4
EBIT	₹ 90,000	₹ 90,000	₹ 90,000	₹ 90,000
– Interest	—	—	12,500	25,000
Profit before Tax	90,000	90,000	77,500	65,000
– Tax @ 30%	27,000	27,000	23,250	19,500
Profit after Tax	63,000	63,000	54,250	45,500
– Preference Dividend	—	30,000	15,000	15,000
Profit for Equity shares	63,000	33,000	39,250	30,500
No. of Equity shares (of ₹ 100 each)	5000	2500	2500	1250
EPS	12.60	13.20	15.70	24.40

In this case, the EPS in under option 1 is ₹ 12.60 (which is also 12.6% on the face value of ₹ 100) and this is just equal to the after tax return on investment of 12.6% *i.e.*, 18% (1–.3). This is because the firm is an all equity firm. However, if the firm opts to have 50% financing from 12% preference share, the EPS increases to ₹ 13.20. The reason for this is obvious. The firm expects to earn 12.6% but is paying 12% to preference shares, consequently the EPS increases. Further, in options 3 & 4, where more and more of 10% debts is introduced replacing equity share capital and preference share capital, the EPS increases. The reason for this being that the after tax cost of 10% debt financing is 7% only. The benefit of cheaper debt financing (which is otherwise earning at 12.6%), is ultimately accruing to the equity shareholders resulting in the gradual increase in EPS from ₹ 13.20 to ₹ 15.76 and then to ₹ 24.40.

The above example shows that the behaviour of the EPS as the result of change in financing pattern depends upon the Return on Investment (ROI) of the firm. Whenever, the ROI of the firm is more than the cost of debt, the financial leverage is said to be favourable. Higher the degree of financial leverage factor, the larger will be the earnings available to the equity share. On the other hand, if the ROI is less than the cost of debts, the financial leverage is said to be unfavourable. Higher the degree of financial leverage, in such cases, smaller will be the earnings available to the equity shareholder. However, if the ROI is just equal to the cost of debt, it can be seen that the financial leverage will not have any effect on the earnings available to the equity shareholders.

Thus, the financial leverage has a favourable impact on the EPS only if the ROI is more than the cost of debt. It will rather have an unfavourable effect if the ROI is less than the cost of debt. That is why financial leverage is also called the ***twin-edged sword***. It turns out that if the firms after tax borrowing cost, which has denoted as k_d is less than after tax ROI, then increase in financial leverage, holding EBIT constant, will always increase the EPS. A reduction in financial leverage reduces the EPS. If k_d is greater than the ROI then the opposite will occur. These relationship, in fact, follow directly from the accounting relationships and always hold good.

VARYING EBIT WITH DIFFERENT PATTERNS : The assumption of constant EBIT (as taken in the above case) is unrealistic and imaginary. In practice, a firm may not able to correctly estimate the EBIT level whatsoever thorough analysis might have been made in this respect. The EBIT level may vary and the actual EBIT may come out to be different than the expected one. Therefore, the effect of financial leverage on the EPS should be analyzed under the assumption of varying EBIT also. The following example will illustrate this point.

Suppose, there are three firms X & Co., Y & Co. and Z & Co. These firms are alike in all respect except the leverage. The financial position of the three firms is presented as follows :

Capital Structure	X & Co.	Y & Co.	Z & Co.
Share Capital (of ₹ 100 each)	₹ 2,00,000	₹ 1,00,000	₹ 50,000
6% Debenture	—	1,00,000	1,50,000
Total	2,00,000	2,00,000	2,00,000

These firms are expected to earn a ROI at different levels depending upon the economic conditions. In normal conditions, the ROI is expected to be 8% which may fluctuate by 3% on either side on the occurrence of bad economic conditions or good economic conditions. How is the return available to the shareholders of the three firms is going to be affected by the variations in the level of EBIT due to differing economic conditions ? The relevant presentations have been shown as follows :

	Poor Eco. Cond.	Normal Eco. Cond.	Good Eco. Cond.
Total Assets	₹ 2,00,000	₹ 2,00,000	₹ 2,00,000
ROI	5%	8%	11%
EBIT	₹ 10,000	₹ 16,000	₹ 22,000

X & Co. (No Financial Leverage) **(Figures in ₹)**

EBIT	10,000	16,000	22,000
– Interest	—	—	—
Profit before Tax	10,000	16,000	22,000
– Tax @ 30%	3,000	4,800	6,600
Profit after Tax	7,000	11,200	15,400
Number of Shares	2,000	2,000	2,000
EPS (₹)	3.50	5.60	7.70

Y & Co. (50% Leverage) **(Figures in ₹)**

EBIT	10,000	16,000	22,000
– Interest	6,000	6,000	6,000
Profit before Tax	4,000	10,000	16,000

– Tax @ 30%	1,200	3,000	4,800
Profit after Tax	2,800	7,000	11,200
Number of Shares	1,000	1,000	1,000
EPS (₹)	2.80	7.00	11.20

Z & Co. (75% Leverage) **(Figures in ₹)**

EBIT	10,000	16,000	22,000
– Interest	9,000	9,000	9,000
Profit before Tax	1,000	7,000	13,000
– Tax @ 30%	300	2,100	3,900
Profit after Tax	700	4,900	9,100
Number of Shares	500	500	500
EPS (₹)	1.20	9.80	18.20

On the basis of the figures given above, it may be analyzed as to how the financial leverage affect the returns available to the shareholders under varying EBIT levels.

It is evident from the above figures that when the economic conditions change from normal to good conditions, the EBIT level increases by 37.5% (*i.e.,* from 8% to 11%). The firm X & Co. having no leverage, is not able to have the magnifying effect of its EBIT and therefore its EPS increases only by 37.5%. On the other hand, the firm Y & Co. (having 50% leverage) is able to have 60% increase in EPS (from ₹ 7 to ₹ 11.20). Similarly, the firm Z & Co. (having still higher leverage of 75%) is able to have an increase of 85.7% in EPS (from ₹ 9.80 to ₹ 18.20). Thus, higher the leverage, greater is the magnifying effect on the EPS in case when the economic conditions improve.

On the other hand, just reverse is the situation in case when the economic conditions worsen and the EBIT level is reduced by 37.5% (*i.e.,* from 8% ROI to 5% ROI). In this case, the EPS of X & Co. reduces only by 37.5% (from ₹ 5.60 to ₹ 3.50), whereas the EPS of Y & Co. (50% leverage) reduces by 60% (from ₹ 7 to ₹ 2.80). In case of Z & Co., the decrease is more pronounced and the EPS reduces by 85.7% (from ₹ 9.80 to ₹ 1.20).

To continue further with the same example, what happens if the ROI is 6% (which is also the cost of debt). This is shown as follows:

	X & Co.	Y & Co.	Z & Co.
Funds Employed	₹ 2,00,000	₹ 2,00,000	₹ 2,00,000
ROI @ 6% *i.e.,* EBIT	12,000	12,000	12,000
– Interest	—	6,000	9,000
Profit before Tax	12,000	6,000	3,000
Tax @ 30%	3,600	1,800	900
Profit after Tax	8,400	4,200	2,100
Number of Shares	2,000	1,000	500
EPS (₹)	4.20	4.20	4.20

There is an interesting point to note here. If the ROI (6%) is just equal to the cost of debt (*i.e.,* 6%) then the financial leverage has no magnifying effect on the EPS. In this situation, all the three firms, levered or unlevered, are expected to have same EPS of ₹ 4.20.

Following conclusions can be drawn on the basis of the above discussion:

1. Effect of financial leverage (*i.e.,* use of debt) depends upon the ROI or EBIT of the Company. When ROI is more than interest on debt, increase in the degree of financial leverage is beneficial.
2. As measured in terms of EPS or Return on Equity, the increase in financial leverage results is higher return to equity shareholders.

FINANCIAL BREAK-EVEN LEVEL : In case the EBIT level of a firm is just sufficient to cover the fixed financial charges then such level of EBIT is known as *financial break-even level.* For example, in the above case, the financial break-even level for firm Y & Co. is ₹ 6,000 and for Z & Co. the financial break-even level is ₹ 9,000 (*i.e.,* just equal to their interest charges respectively). Thus, the financial break-even level is such a level of EBIT at which only the fixed financial charges of the firm are covered and consequently the EPS is zero. If the EBIT reduces below this financial break-even level, the EPS will be negative. The financial break-even level of EBIT may be calculated as follows :

If the firm has employed debt only (and no preference shares), the financial break-even EBIT level is :

Financial break-even EBIT = Interest Charge

If the firm has employed debt as well as preference share capital, then its financial break-even EBIT will be determined not only by the interest charge but also by the fixed preference dividend. It may be noted that the preference dividend is payable only out of profit after tax, whereas the financial break-even level is before tax. The financial break-even level in such a case may be determined as follows :

Financial break-even EBIT = Interest Charge + Pref. Div./(1–t)

For example, a firm is having interest liability of ₹ 20,000 and preference dividend of ₹ 36,000. Given the tax rate of 30% and corporate dividend tax rate of 20%, find out the financial break-even level and verify the result. The financial break-even level for the firm may be ascertained as follows :

Financial break-even EBIT = Interest Charge + Pref. Div./(1–t)

or = Interest charge + (Pref. Div. + Corp. Div. Tax) ÷ (1–t)

= ₹ 20,000 + ₹ (36,000 + 7,200)/(1–.3)

= ₹ 81,714.

Verification : If the firm has EBIT of ₹ 81,714, out of this interest of ₹ 20,000 will be paid and the remaining profit of ₹ 61,714 will be subject to tax at 30%. So, the profit after tax would be ₹ 43,200 which is just sufficient to pay the Preference Dividend and the corporate dividend tax on Pref. Dividend and no profit will be available for the equity shareholders and the EPS would be zero. So, the financial break-even level may be defined as that level of EBIT at which the EPS would be zero.

INDIFFERENCE POINT/LEVEL : The indifference level of EBIT is one at which the EPS under two or more capital structures are same. While designing a capital structure, a firm may evaluate the effect of different financial plans on the level of EPS, for a given level of EBIT. Out of several available financial plans, the firm may have two or more financial plans which result in the same level of EPS for a given EBIT. Such a level of EBIT at which the firm has two or more financial plans resulting in same level of EPS, is known as indifference level of EBIT.

The use of financial break-even level and the return from alternative capital structures is called the indifference point analysis. The EBIT is used as a dependent variable and the EPS from two alternative financial plans is used as independent variable, and the exercise is known as indifference point analysis. The indifference level of EBIT is a point at which the after tax cost of debt is just equal to the ROI. At this point the firm would be indifferent whether the funds are raised by the issue of debt securities or by the issue of share capital. The following example will illustrate this point.

Suppose, PQR & Co. is expecting an EBIT of ₹ 55,00,000 after implementing the expansion plan for ₹ 50,00,000. The funds requirements needed to implement the plan can be raised either by the issue of further equity share capital at an issue price of ₹ 5,000 each, or by the issue of 10% debenture. Find out the EPS under these two alternative plans if the existing capital structure of the firm stands at 10,000 shares. The above situation can be analyzed as follows :

	Financial Plan 1	**Financial Plan 2**
Number of existing shares	10,000	10,000
Number of new shares	1,000	—
Total Number of shares	11,000	10,000
10% Debenture	—	₹ 50,00,000
EBIT (Given)	₹ 55,00,000	₹ 55,00,000
– Interest	—	5,00,000
Profit before Tax	55,00,000	50,00,000
Tax @ 30%	16,50,000	15,00,000
Profit after Tax	38,50,000	35,00,000
EPS (₹)	350	350

So, at the EBIT level of ₹ 55,00,000, the EPS is expected to be ₹ 350 irrespective of the fact whether the additional funds are raised by the issue of equity share capital or by the issue of 10% debt. This EBIT level of ₹ 55,00,000 is known as the indifference level of EBIT. However, in case the company is expecting EBIT of ₹ 50,00,000 or ₹ 60,00,000, the EPS for both the financial plans has been calculated in the following table:

	Financial Plan 1		**Financial Plan 2**	
EBIT	₹ 50,00,000	₹ 60,00,000	₹ 50,00,000	₹ 60,00,000
– Interest	—	—	5,00,000	5,00,000
Profit before Tax	50,00,000	60,00,000	45,00,000	55,00,000
Tax @ 30%	15,00,000	18,00,000	13,50,000	16,50,000
Profit after Tax	35,00,000	42,00,000	31,50,000	38,50,000
Number of Equity shares	11,000	11,000	10,000	10,000
EPS (₹)	318.18	381.82	315.00	385.00

The above figures show that for an EBIT level below the indifference level of ₹ 55,00,000, the EPS is lower at ₹ 315 in case of leveraged option (*i.e.*, debt financing) than the EPS of unleveraged option of ₹ 318.18. However, if the EBIT is higher than the indifference level, then the EPS is higher at ₹ 385 in case of levered option than the EPS of ₹ 381.82 under unlevered option. So, the firm can identify the value of EPS produced by each alternative capital structure for different values of EBIT.

The indifference level of EBIT can be identified graphically by plotting the EBIT-EPS lines for various financial plans. This has been shown in Figure 12.1. The EBIT level at which the plotted lines of different EBIT-EPS values interest, when shown graphically, is called the EBIT indifference point. This value of EBIT produces the same value of EPS for alternative financial plans. If the firm expects to generate exactly the same amount of EBIT at which the EBIT-EPS lines intersect, then from the point of view of the equity shareholders, the firm would be indifferent as to choice of capital structure because the same EPS would result from either of the alternatives.

The Figure 7.1 shows that if the firm expects the EBIT at a level higher than the indifference level, plan I is better and the EPS will be higher than EPS under plan II. However, if the expected level of EBIT is less than the indifference level of EBIT, than plan II is better as the EPS under plan II will be higher. It is only in such a situation when the expected EBIT is just equal to the indifference level of EBIT that the EPS under both the plans would be same.

The EBIT-EPS line for a particular financial plan also shows the financial break even level of EBIT. The intercepts on the horizontal axis OA (in case of plan II) and OB (in case of plan I) are the financial break even level of EBIT under respective financial plans. For example, if the EBIT of the firm is expected to be OA, then under plan I, the EPS would be zero. At EBIT less then OA, the EPS would be negative. Similarly, under plan II, the EPS would be zero at OB level of EBIT. If the expected level of EBIT is less than OB, then EPS under plan II would be negative.

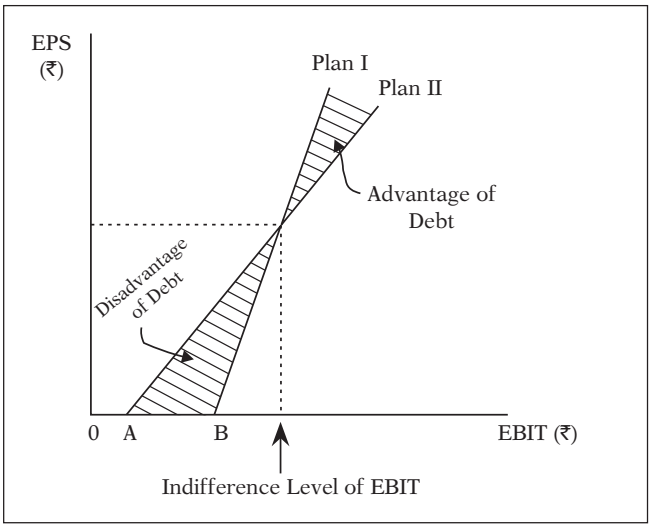

FIG.7.1 : GRAPHICAL PRESENTATION OF INDIFFERENCE LEVEL

Figure 7.1 also shows disadvantage of debt and advantage of debt. Capital plan I seems to have higher degree of debt, however the EPS is lower than that of plan II upto indifference level of EBIT. So, the higher degree of debt brings a disadvantage to the firm by lowering down the EPS. Beyond the indifference level of EBIT, the plan I shows higher EPS then that of Plan II, so higher degree of debt brings advantage to the firm by increasing the EPS. If the EBIT of the firm is less than or equal to the indifference level, the debt has unfavourable impact, and beyond that the impact is favourable.

The indifference level of EBIT can be calculated mathematically also. For this purpose, one has to formulate simple equations for the conditions underlying any intersecting pair of line. EPS are then set as equal for the two alternatives, and the equations are solved for the value of EBIT level at which this condition hold. Example 7.1 illustrates this point.

Example 7.1

ABC Ltd. has a current level of EBIT of ₹ 17,00,000 which is likely to be unchanged. It has decided to raise ₹ 5,00,000 of additional capital funds and has identified two mutually exclusive alternative financial plans. The relevant information is as follows :

Present Capital Structure	:	3,00,000 Equity shares of ₹ 10 each, and 10% Bonds of ₹ 20,00,000
Tax rate	:	30%
Current EBIT	:	₹ 17,00,000
Current EPS	:	₹ 2.50
Current market price	:	₹ 25 per share
Financial Plan I	:	20,000 equity shares @ ₹ 25 per share
Financial Plan II	:	12% debentures of ₹ 5,00,000.

What is the indifference level of EBIT? What are the financial break-even levels and plot the EBIT-EPS lines on the graph paper. Which alternative financial plan is better ?

Solution :

If Plan I is accepted, then the new capital structure of the firm is expected to consist of 3,20,000 equity shares and 10% bonds of ₹ 20,00,000. The EPS of the firm in this case would be :

$$EPS_{Plan\ I} = \frac{(EBIT - 2,00,000)(1-.3)}{3,20,000}$$

$$= \frac{.7\ EBIT - 1,40,000}{3,20,000}$$

If Plan II is adopted then the capital structure of the firm would consist of 3,00,000 equity shares, 10% bonds of ₹ 20,00,000 and 12% debentures of ₹ 5,00,000. The EPS of the firm in this case would be :

$$EPS_{Plan\ II} = \frac{(EBIT - 2,00,000 - 60,000)(1-.3)}{3,00,000}$$

$$= \frac{.7\ EBIT - 1,82,000}{3,00,000}$$

In order to find out the indifference level of EBIT, the EPS under the two plans should be equated as follows :

$$= \frac{.7\ EBIT - 1,40,000}{3,20,000} = \frac{.7\ EBIT - 1,82,000}{3,00,000}$$

Now, solving this equation for the value of EBIT,

EBIT = ₹ 11,60,000

So, the value of EBIT at the indifference level is ₹ 11,60,000 and the corresponding values of EPS under both the financial plans would be :

$$EPS_{Plan\ I} = \frac{.7\ (11,60,000) - 1,40,000}{3,20,000} = ₹\ 2.10$$

$$EPS_{Plan\ II} = \frac{.7\ (11,60,000) - 1,82,000}{3,00,000} = ₹\ 2.10$$

The financial break-even levels for the two plans are :

Plan I– ₹ 2,00,000 (*i.e.*, 10% interest on ₹ 20,00,000)

Plan II– ₹ 2,60,000 (*i.e.*, 10% interest on ₹ 20,00,000 and 12% interest on ₹ 5,00,000).

The financial break-even levels and the EBIT-EPS lines of both the financial plans have been shown in Figure 7.2.

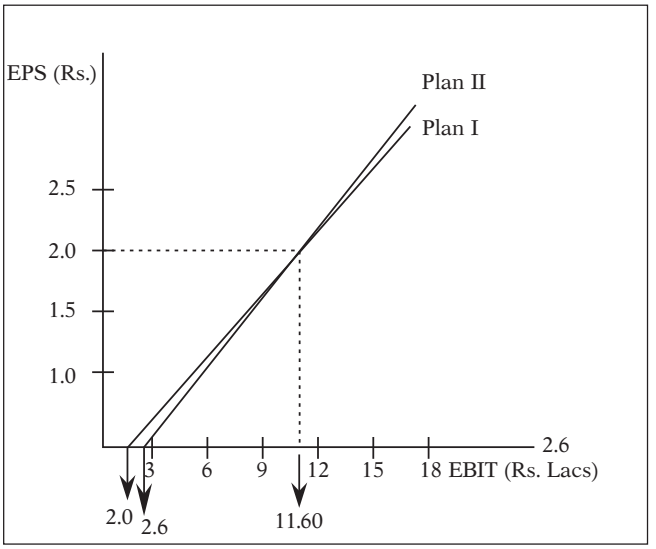

FIG. 7.2 : EBIT-EPS INDIFFERENCE POINT AND FINANCIAL BREAK EVEN LEVELS

The Figure 7.2 provides important information regarding the financial plans. To the right of indifference point, the Plan II is better. Similarly, Plan I is better for the values of EBIT below the indifference point. In addition, the horizontal intercepts identify the financial break-even levels of EBIT for each plan. Once the EBIT indifference point has been obtained, the next step is to identify the better financial plan out of Plans I and II. At the current level of EBIT of ₹ 17,00,000 (which is more than the indifference level EBIT of ₹ 11,60,000), the Plan II is better. But whether Plan II is more profitable than the present capital structure in terms of EPS ?

At the current level of EBIT of ₹ 17,00,000, the current EPS is ₹ 2.50 (given). However, if the Plan II is adopted and the funds

of ₹ 5,00,000 are raised by the issue of 12% debentures, then the new EPS would be

$$EPS_{Plan\ II} = \frac{(17,00,000 - 2,00,000 - 60,000)\ (1-.5)}{3,00,000} = ₹\ 2.40$$

So, the new capital structure (after implementation of Plan II) is having an EPS of ₹ 2.40 and is less profitable than the present capital structure (EPS ₹ 2.50) at the current level of EBIT of ₹ 17,00,000. However, what level of EBIT is required to maintain the current level of EPS of ₹ 2.50 ? This may be ascertained as follows :

$$EBIT = \frac{EPS \times (No.\ of\ equity\ shares) + PD}{(1 - t)} + Int.$$

$$= \frac{2.50 \times 3,00,000}{(1-.5)} + 2,60,000 = ₹\ 17,60,000$$

If the firm is hopeful of raising the EBIT up to ₹ 17,60,000, it will be able to maintain the EPS of ₹ 2.50 even under Plan II. However, if the firm adopts the Plan I, then the EPS of ₹ 2.50 will be maintained only at the EBIT level of

$$EBIT = \frac{EPS \times (No.\ of\ equity\ shares) + PD}{(1-t)} + Int.$$

$$= \frac{2.50 \times 3,20,000}{(1-.5)} + 2,00,000 = ₹\ 18,00,000$$

Again, the Plan II seems to be better as the firm would be able to maintain the EPS of ₹ 2.50 at the EBIT of ₹ 17,60,000 only, whereas in case of Plan I EBIT of ₹ 18,00,000 is required for this purpose. In terms of profitability, the final choice between two plans is based on the likelihood that the funds of ₹ 5,00,000 raised by the issue of 12% debentures can be used to generate additional EBIT of ₹ 60,000 or not ? If the firm is unable to do so, then result would be a larger firm in terms of total assets but having lower EPS than ₹ 2.50. However, if the increase in EBIT is more than ₹ 60,000, then as a result of use of financial leverage, the effect on the EPS will be magnified.

Thus, determinations of the indifference point between the two alternative financial plans, say A and B, may be attempted on the basis of the basic premise that at the indifference level, the EPS of two alternative financial plans are equal *i.e.*, $EPS_A = EPS_B$. The indifference level of EBIT for a given set of financial plans can be ascertained as follows :

(*a*) **All-equity financing** *v.* **Debt-equity mix :** EPS under All-equity financing is :

$$EPS = \frac{EBIT\ (1-t)}{N_1}$$

EPS under Debt-equity mix is :

$$EPS = \frac{(EBIT - Int.)\ (1-t)}{N_2}$$

where, Int. = Total interest charge on debt financing.

N_1 = Total No. of Equity shares under financial plan 1

N_2 = Total No. of Equity shares under financial plan 2

t = Tax rate.

Since, the EPS is made to be equal under two different plans (for the same EBIT), now setting the two EPS equal to each other,

$$\frac{EBIT\ (1-t)}{N_1} = \frac{(EBIT - Int.)\ (1-t)}{N_2}$$

The value of EBIT in the above equation is the indifferent level of EBIT for a choice between the all equity financial plan and the debt equity mix financial plan.

(*b*) **Debt-equity mix** *v.* **Debt-equity mix (different level of debt financing or different rates of interest on debts):** In this case, the indifferent level of EBIT may be ascertained on the same lines as above. Suppose, $Int._1$ and $Int._2$ are the total interest payments under two different financial plans. Now, the indifference level of EBIT may be ascertained on the basis of the following equation :

$$\frac{(EBIT - Int._1)\ (1-t)}{N_1} = \frac{(EBIT - Int._2)\ (1-t)}{N_2}$$

The value of EBIT in this equation is the indifference level of EBIT between two different Debt-equity plans.

(*c*) **All-equity plan** *v.* **Equity-preference plan :** In this case, the firm will be required to pay the Preference Dividend (PD) also, therefore,the indifference level of EBIT may be ascertained as follows :

$$\frac{EBIT\ (1-t)}{N_1} = \frac{EBIT\ (1-t) - PD}{N_2}$$

The value of EBIT in the above equation is the indifference level of EBIT between two financial plans *i.e.*, the All-equity plan and the Equity-preference plan.

(*d*) **All-equity plan** *v.* **Equity-preference-debt mix :** A firm may be having a situation to make a choice between an all equity plan and the financial mix consisting of equity capital, preference capital and debt. In such a case, the indifference level of EBIT may be ascertained from the following equation :

$$\frac{EBIT\ (1-t)}{N_1} = \frac{(EBIT - Int.)\ (1-t) - PD}{N_2}$$

In the calculations (*c*) and (*d*) above, the PD may be taken as inclusive of corporate dividend tax.

The value of EBIT in the above equation is the indifference level of EBIT and the EPS under the two financial plans would be same. On the same lines, the indifference level of EBIT of many other alternative financial plans may also be ascertained.

Example 7.2

ABC Ltd. is considering a capital structure of ₹ 10,00,000 for which various mutually exclusive set of options are available. Calculate the indifference level of EBIT between the following alternative sets :

I. Equity share capital of ₹ 10,00,000, or 15% Debentures of ₹ 5,00,000 plus equity share capital of ₹ 5,00,000.

II. Equity share capital of ₹ 10,00,000, or 13% Pref. shares capital of ₹ 5,00,000 plus Equity share capital of ₹ 5,00,000.

III. Equity share capital of ₹ 6,00,000 plus 15% debentures of ₹ 4,00,000, or Equity share capital of ₹ 4,00,000 plus 13% Pref. shares capital of ₹ 2,00,000 plus 15% debenture of ₹ 4,00,000.

IV. Equity share capital of ₹ 8,00,000 plus 13% Pref. shares capital of ₹ 2,00,000, or Equity share capital of ₹ 4,00,000 plus 13% Pref. shares capital of ₹ 2,00,000 plus 15% debentures of ₹ 4,00,000.

The issue price of equity shares may be taken at par *i.e.,* ₹ 100 each and the tax rate may be assumed at 30%. Find out indifference point of EBIT for different sets.

Solution :

The indifference point of EBIT of various sets may be ascertained as follows :

I. In this case, the choice is to be made between All-equity capital and Equity-debt mix. The number of equity shares in plan one is 10,000 whereas in plan 2 only 5,000 shares would be issued. In plan 2 the amount of interest would be 15% of ₹ 5,00,000 *i.e.,* ₹ 75,000. The indifference level of EBIT is the value of EBIT in the following equation :

$$\frac{EBIT(1-.3)}{10,000} = \frac{(EBIT - 75,000)(1-.3)}{5,000}$$

$$EBIT = ₹\ 1,50,000$$

II. In this case, the choice is to be made between All-equity capital and Equity-preference mix. The number of equity shares in plan one is 10,000 whereas in plan 2 only 5,000 shares would be issued. In plan 2 the amount of preference dividend would be 13% of ₹ 5,00,000 *i.e.,* ₹ 65,000. The indifference level of EBIT is the value of EBIT in the following equation :

$$\frac{EBIT\ (1-.3)}{10,000} = \frac{EBIT\ (1-.3) - ₹\ 65,000}{5,000}$$

$$EBIT = ₹\ 1,85,714$$

III. In this case, the choice is to be made between Equity-debt mix and Equity-preference-debenture mix. The number of equity shares in plan 1 is 6,000 and the amount of interest is 15% of ₹ 4,00,000 *i.e.,* ₹ 60,000; whereas in plan 2 only 4,000 equity shares would be issued. In plan 2 the amount of preference dividend would be 13% of ₹ 2,00,000 *i.e.,* ₹ 26,000 and the interest would be 15% of ₹ 4,00,000 *i.e.,* ₹ 60,000. The indifference level of EBIT is the value of EBIT in the following equation :

$$\frac{(EBIT - 60,000)(1-.3)}{6,000} = \frac{(EBIT - 60,000)(1-.3) - 26,000}{4,000}$$

$$EBIT = ₹\ 1,71,429$$

IV. In this case, the choice is to be made between Equity-preference mix and Equity-preference-debenture mix. The number of equity shares in plan 1 is 8,000 and the amount of preference dividend is 13% of ₹ 2,00,000 *i.e.,* ₹ 26,000; whereas in plan 2 only 4,000 equity shares would be issued. In plan 2 the amount of preference dividend would be 13% of ₹ 2,00,000 *i.e.,* ₹ 26,000 and the interest would be 15% of ₹ 4,00,000 *i.e.,* ₹ 60,000. The indifference level of EBIT is the value of EBIT in the following equation :

$$\frac{EBIT\ (1-t) - PD}{N_1} = \frac{(EBIT - Int.)\ (1-t) - PD}{N_2}$$

$$\frac{EBIT(1-.3) - 26,000}{8,000} = \frac{(EBIT - 60,000)\ (1-.3) - 26,000}{4,000}$$

$$EBIT = ₹\ 1,72,000$$

So, the firm has different indifference level of EBIT for different sets of alternative financial plans. These indifferent level of EBIT can be verified by finding out the EPS under Plan 1 and Plan 2 for all the mutually exclusive sets as follows :

Set No.	Indifference Level	EPS(Plan 1)	EPS(Plan 2)
I	₹ 1,50,000	₹ 105	₹ 10.5
II	2,60,000	13.0	13.0
III	2,16,000	13.0	13.0
IV	1,72,000	10.5	10.5

Short-falls of EBIT-EPS Analysis : The EBIT-EPS analysis helps in making a choice for a better financial plan. However, it may have two complications, namely :

1. If neither of the two mutually exclusive alternative financial plans involves issue of new equity shares, then no EBIT indifference point will exist. For example, a firm has a capital consisting of 1,00,000 equity shares and wants to raise ₹ 10,00,000 additional funds for which the following two plans are available : (*i*) to issue 10% bonds of ₹ 10,00,000, or (*ii*) to issue 12% preference shares of ₹ 100 each. Assuming tax rate to be 30%, the indifference level of EBIT for the two plans would be as follows :

$$\frac{(EBIT - 1,00,000)\ (1-.3)}{1,00,000} = \frac{EBIT\ (1-.3) - 1,20,000}{1,00,000}$$

$$.7\ EBIT - 50,000 = .7\ EBIT - 1,20,000$$

$$0 = -50,000$$

So, there is an inconsistent result and it indicates that there is no indifference point of EBIT. If the EBIT-EPS lines of these two plans are drawn graphically, there will be no intersection point.

2. Sometimes, a given set of alternative financial plans may give negative EPS to cause an indifference level of EBIT. For example, a firm having 1,00,000 equity shares already

issued, requires additional funds of ₹ 10,00,000 for which the following two options are available : (*i*) to issue 20,000 equity shares of ₹ 25 each and to raise to ₹ 5,00,000 by the issue of 9% Bonds, or (*ii*) to issue 30,000 equity shares at ₹ 25 each and to issue 2,500 12% preference shares of ₹ 100 each. Assuming the tax rate to be 50%, the indifference level of EBIT for the two plans would be as follows :

$$\frac{(EBIT - 45{,}000)\,(1-.5)}{1{,}20{,}000} = \frac{EBIT\,(1-.5) - 30{,}000}{1{,}30{,}000}$$

$$EBIT = ₹ -1{,}35{,}000$$

So, the indifference point occurs at a negative value of EBIT, which is imaginary.

Conclusion : The financial leverage affects both the quantum as well as the variability of EPS. For any given level of operating profits *i.e.*, EBIT, the effect of an increase in leverage is favourable if the % rate of return *i.e.*, % ROI is greater than the after tax cost of debt; and is unfavourable if the % ROI is more than the after tax cost of debt. In case, the EBIT varies over time, the presence of financial leverage helps magnifying the EPS. Variability of EPS therefore, stems from two factors: (*i*) Variability of EBIT (which is affected by the business risk complexion of the firm, and (*ii*) The degree of financial leverage (which refers to the financial risk).

The EPS rule leads to more and more inclination towards debt financing. When the after tax cost of debt financing *i.e.*, k_d is less than ROI, the debt introduction in the capital structure will lead to a higher EPS for a given level of EBIT. So, debt is the obvious choice. If the EPS rule is applied consistently over the long run, the firm is likely to employ debts each time the funds are raised because expected EPS continues to increase gradually.

However, the basic problem with the EPS rule is that it ignores the risk factor, *i.e.*, the financial risk which increases every debt financing. The EPS rule says that the debt is better because it shows higher EPS at the expected level of EBIT. The EPS rule considers only the expected value but not the variability about that expected value. The investors are, in all likelihood, concerned with both the expected value and its variability, and consider both in valuing the firm's share. If a firm increases debt beyond some point, it will improve the expected EPS but nonetheless it will result in, expectedly, a decline in the market price of the share. The effect on market price may be more if the investors become more concerned about the increase in financial risk.

If the debt financing is availed beyond a point, there comes a point where the share prices will begin to fall. Further, increase in debt financing causes expected rate of return of equity investors to rise and consequently causes the share prices to fall. So, the EPS rule may lead to some errors when applied to financing decisions. Most firm would be tempted to use higher financial leverage, because debt financing shows higher expected EPS.

POINTS TO REMEMBER

- In addition to Leverage Analysis, the EBIT- EPS Analysis is another way of looking at the effects of different types of capital structures. EBIT-EPS Analysis considers the effect on EPS under different types of capital mix.
- Given a level of EBIT, a particular combination of different sources (*i.e.* Debt, Pref. share capital and Equity share capital) will result in a particular level of EPS and therefore, for different financing patterns there would be different levels of EPS.
- For a given level of EBIT, higher the degree of financial leverage, *i.e.* higher the level of debt financing, greater would be the EPS (provided ROI is more than cost of debt). However, if the ROI is less than cost of debt, then the effect of increase in leverage on EPS would be negative.
- Financial break even level of EBIT is that level of EBIT at which the EPS of the firm is zero.
- Financial Break-even level is calculated as:
  Financial Break-even level = Interest
  or = Interest + (Pref. Dividend ÷ (1–t))
- Indifference level of EBIT is one at which the EPS remains same under two different financial plans.
- At the Indifference level of EBIT, the firm would be indifferent whether the funds are raised by one capital mix or another because both will have same level of EPS.
- Indifference level of EBIT may be ascertained graphically or with the help of mathematical formulation. The Indifference level for an All-Equity plan and Equity-Debt plan may be arrived at as follows :

$$\frac{EBIT(1-t)}{N_1} = \frac{(EBIT - Int(1-t))}{N_2}$$

The value of EBIT in this equation is the Indifference level of EBIT.

GRADED ILLUSTRATIONS

Illustration 7.1

The balance sheet of Alpha Numeric Company is given below :

Liabilities	Amount	Assets	Amount
Equity capital (₹ 10 per share)	₹ 90,000	Fixed assets	₹ 2,25,000
Retained earnings	30,000	Current assets	75,000
10% Debt	1,20,000		
Current liabilities	60,000		
	3,00,000		3,00,000

The company's total assets turnover ratio is 3, its fixed operating cost is ₹ 1,50,000 and its variable operating cost ratio is 50%. The income-tax rate is 50%.

You are required to :

(*i*) Calculate the different type of leverages for the company.

(*ii*) Find out the EBIT if EPS is : (*a*) ₹ 1 (*b*) ₹ 2 (*c*) ₹ 0.

Solution :

Income Statement of Alpha Numeric Company

$$\text{Assets turnover ratio} = \frac{\text{Sales}}{\text{Total Assets}}$$

Sales	$= 3 \times 3,00,000 =$	₹ 9,00,000
Less : Variable cost (50% of sales)		4,50,000
Contribution		4,50,000
Less : Fixed operating cost		1,50,000
Earnings Before Interest and Taxes (EBIT)		3,00,000
Less : Interest (10% of ₹ 1,20,000)		12,000
Earnings before Taxes (EBT)		2,88,000
Less: Taxes (50%)		1,44,000
Profit after Taxes (PAT)		1,44,000

Leverages :

$$\text{Operating Leverage} = \frac{\text{Contribution}}{\text{EBIT}} = \frac{₹\ 4,50,000}{₹\ 3,00,000} = 150$$

$$\text{Financial Leverage} = \frac{\text{EBIT}}{\text{Earnings Before Tax}} = \frac{₹\ 3,00,000}{₹\ 2,88,000} = 1.04$$

$$\text{Combined Leverage} = \text{Operating Leverage} \times \text{Financial Leverage}$$
$$= 1.50 \times 1.04 = 1.56$$

Determination of EBIT at various levels of EPS :

EBIT at various levels of EPS can be worked out by using the following formula :

$$EPS = \frac{(EBIT - I)(1 - t)}{N}$$

where, I stands for interest,

t stands for taxes, and

N stands for number of shares.

If EPS = ₹ 1: $₹\ 1 = \frac{(EBIT - 12,000)\ (1-.5)}{9,000}$

EBIT = ₹ 30,000

If EPS = ₹ 2: $₹\ 2 = \frac{(EBIT - 12,000)\ (1-.5)}{9,000}$

EBIT = ₹ 48,000

If EPS = ₹ 0 $₹\ 0 = \frac{(EBIT - 12,000)\ (1-.5)}{9,000}$

EBIT = ₹ 12,000

Illustration 7.2

Bhaskar Manufacturer Ltd. has Equity share capital of ₹ 5,00,000 (face value ₹ 100). To meet the expenditure of an expansion program, the company wishes to raise ₹ 3,00,000 and is having following four alternative sources to raise the funds :

Plan A : To have full money from the issue of Equity shares.

Plan B : To have ₹ 1,00,000 from Equity and ₹ 2,00,000 from borrowings from the financial institutions @ 10% per annum.

Plan C : Full money from borrowings @ 10% per annum.

Plan D : ₹ 1,00,000 in Equity and ₹ 2,00,000 from 8% Preference shares.

The company is having present earnings of ₹ 1,50,000. The corporate tax is 30%. Select a suitable plan out of the above four plans to raise the required funds.

Solution : **DETERMINATION OF SUITABLE PLAN FOR RAISING FUNDS** **(₹ in lacs)**

	EBIT	Interest	Tax (30%)	PAT	Pref. Div.	Profit (Net)	No. of Shares	EPS (₹)
Plan A	1.50	—	0.45	1.05	—	1.05	8,000	13.13
Plan B	1.50	0.20	0.39	0.91	—	0.91	6,000	15.17
Plan C	1.50	0.30	0.36	0.84	—	0.84	5,000	16.80
Plan D	1.50	—	0.45	1.05	0.16	0.89	6,000	14.83

Return to shareholders in the form of earning per share is highest in Plan C and is therefore acceptable.

Illustration 7.3

The existing capital structure of ABC Ltd. is as follows:

Equity shares of ₹ 100 each	:	₹ 40,00,000
Retained earnings	:	₹ 10,00,000
9% Preference Shares	:	₹ 25,00,000
7% Debentures	:	₹ 25,00,000

The company earns a return (EBIT) of 12% and the tax on income is 30%.

The company wants to raise ₹ 25,00,000 for its expansion project for which it is considering following alternatives:

(*i*) Issue of 20,000 Equity shares at a premium of ₹ 25 per share.

(*ii*) Issue of 10% Preference Shares.

(*iii*) Issue of 9% Debentures.

It is projected that the P/E ratios in case of Equity, Preference and Debenture financing shall be 20, 17 and 16 respectively.

Which alternative would you consider to be the best? Give reasons for your choice. *[B. Com.(H)., D.U., 2010]*

Solution :

Existing Financing	₹ 1,00,00,000
New Financing required	25,00,000
EBIT	12%
New EBIT (1,25,00,000 × 12%)	₹ 15,00,000

Calculation of EPS and MP under various alternatives:

	Case I	Case II	Case III
EBIT	₹ 15,00,000	₹ 15,00,000	₹ 15,00,000
– Interest @ 7%	1,75,000	1,75,000	1,75,000
– Interest @ 9%	—	—	1,75,000
Profit before Tax	13,25,000	13,25,000	11,50,000
– Tax @ 30%	3,97,500	3,97,500	3,45,000
Profit after Tax	9,27,500	9,27,500	8,05,000
– Pref. Div. @ 9%	2,25,000	2,25,000	2,25,000
– Pref. Div. @ 10%	—	2,50,000	—
NP for Equity	7,02,500	4,52,500	5,80,000
No. of Equity Shares (Total)	60,000	40,000	40,000
Earnings Per Share	11.71	11.31	14.50
P/E Ratio	20	17	16
MP of Equity Shares	234.20	192.27	232.00

The Case I (Equity financing) is best because the MP of Equity shares is expected highest in this case.

Illustration 7.4

A Ltd. has a share capital of ₹ 1,00,000 divided into share of ₹ 10 each. It has a major expansion program requiring an investment of another ₹ 50,000. The management is considering the following alternatives for raising this amount:

(*i*) Issue of 5,000 equity shares of ₹ 10 each.

(*ii*) Issue of 5,000, 12% preference shares of ₹ 10 each.

(*iii*) Issue of 10% debentures of ₹ 50,000.

The company's present earnings before interest and tax (EBIT) are ₹ 40,000 per annum subject to tax @ 30%. You are required to calculate the effect of each of the above financial plan on the earnings per share presuming :

(*a*) EBIT continues to be the same even after expansion.

(*b*) EBIT increases by ₹ 10,000.

Solution :

(*a*) **When EBIT is ₹ 40,000 per annum:**

PROJECTED EARNINGS PER SHARE

	Plan I	Plan II	Plan III
EBTT	₹ 40,000	₹ 40,000	₹ 40,000
–Interest	—	—	5,000
Profit before Tax	40,000	40,000	35,000
–Tax @ 30%	12,000	12,000	10,500
Profit after Tax	28,000	28,000	24,500
–Pref. Dividend	—	6,000	—
Profit for Equity	28,000	22,000	24,500
Number of Equity shares	15,000	10,000	10,000
EPS (₹)	1.87	2.20	2.45

(*b*) **When EBIT is expected to increase by ₹ 10,000:**

PROJECTED EARNINGS PER SHARE

	Plan I	Plan II	Plan III
EBIT	₹ 50,000	₹ 50,000	₹ 50,000
–Interest	—	—	5,000
Profit before Tax	50,000	50,000	45,000
–Tax @ 30%	15,000	15,000	13,500
Profit after Tax	35,000	35,000	31,500
–Pref. Dividend	—	6,000	—
Profit for Equity	35,000	29,000	31,500
Number of Equity shares	15,000	10,000	10,000
EPS (₹)	2.33	2.90	3.15

So, under both assumptions of EBIT, the EPS would be highest in Plan III.

Illustration 7.5

A company needs ₹ 12,00,000 for the installation of a new factory which is expected to earn an EBIT of ₹ 2,00,000 per annum. The company has the objective of maximizing the earnings per share. It is considering the possibility of issuing equity shares plus raising a debt of ₹ 2,00,000 or ₹ 6,00,000 or ₹ 10,00,000. The current market price of the share is ₹ 40 and will drop to ₹ 25 if the borrowings exceed ₹ 7,50,000. The cost of borrowing are indicated as under :

Up to ₹ 2,50,000	10%
₹ 2,50,000–6,25,000	14%
₹ 6,25,000–10,00,000	16%

Assuming the tax rate to be 50%, find out the EPS under different options.

Solution :

	Plan I	Plan II	Plan III
Total financing	₹ 12,00,000	₹ 12,00,000	₹ 12,00,000
–Debt Financing	2,00,000	6,00,000	10,00,000
Equity Financing	10,00,000	6,00,000	2,00,000
Issue Price	40	40	25
Number of shares	25,000	15,000	8,000
Computation of Interest:			
10% of ₹ 2,00,000	₹ 20,000	—	—
14% of ₹ 6,00,000	—	84,000	—
16% of ₹ 10,00,000	—	—	1,60,000
Total Interest	20,000	84,000	1,60,000
Calculation of EPS:			
EBIT	2,00,000	2,00,000	2,00,000
Interest	20,000	84,000	1,60,000
Profit before Tax	1,80,000	1,16,000	40,000
Tax @ 50%	90,000	58,000	20,000
Profit after Tax	90,000	58,000	20,000
Number of shares	25,000	15,000	8,000
EPS (₹)	3.60	3.87	2.50

The EPS is highest (*i.e.*, ₹ 3.87) under the Plan II. The borrowings under this plan *i.e.*, ₹ 6,00,000 is also within limits and the market price would be maintained at ₹ 40.

Illustration 7.6

X Co. Ltd. is considering three different plans to finance its total project costs of ₹ 100 lacs. These are :

(₹ in Lacs)

	Plan A	Plan B	Plan C
Equity (₹ 100 per share)	50	34	25
8% Debentures	50	66	75
	100	100	100

Sales for the first three years of operations are estimated at ₹ 100 lacs, ₹ 125 lacs and ₹ 150 lacs and a 10% profit before interest and taxes is forecast to be achieved, Corporate taxation to be taken at 30%. Compute earnings per share in each of the alternative plans of financing for the three years and evaluate the proposals.

Solution :

EARNING PER SHARE UNDER DIFFERENT ALTERNATIVES

(₹ in lacs)

	EBIT	Interest	Tax 50%	PAT	No. of Shares	EPS (₹)
Plan A						
Year 1	10.00	4.00	1.80	4.20	50,000	8.40
Year 2	12.50	4.00	2.55	5.95	50,000	11.90
Year 3	15.00	4.00	3.30	7.70	50,000	15.40
Plan B						
Year 1	10.00	5.28	1.42	3.30	34,000	9.70
Year 2	12.50	5.28	2.17	5.05	34,000	14.85
Year 3	15.00	5.28	2.92	6.80	34,000	20.00
Plan C						
Year 1	10.00	6.00	1.20	2.80	25,000	11.20
Year 2	12.50	6.00	1.95	4.53	25,000	18.20
Year 3	15.00	6.00	2.70	6.30	25,000	25.20

Out of the three financial plans, the Plan C is expected to have highest EPS in all the three years and therefore may be adopted by the firm.

Illustration 7.7

A firm is considering alternative proposals to finance its expansion plan of ₹ 4,00,000. Two such proposals are :

(*i*) Issue of 15% loans of ₹ 2,00,000 and issue of 2,000 equity shares of 100 each, and

(*ii*) Issue of 4,000 equity shares of 100 each.

Given the tax rate at 30%, and assuming EBIT of ₹ 70,000 and ₹ 80,000, which alternative is better ? Also compute the indifference level of EBIT of the two financial plans.

Solution :

CALCULATION OF EPS UNDER DIFFERENT SITUATIONS :

	Plan I	Plan I	Plan II	Plan II
EBIT	70,000	80,000	70,000	80,000
–Interest @ 15%	30,000	30,000	—	—
Profit before Tax	40,000	50,000	70,000	80,000
–Tax @ 30%	12,000	15,000	21,000	24,000
Profit after Tax	28,000	35,000	49,000	56,000
Number of shares	2,000	2,000	4,000	4,000
EPS	14.00	17.50	12.25	14.00

Since, the Plan I (consisting of both loan and equity) is having higher EPS under both conditions of EBIT, therefore, it is recommended. The indifference level of EBIT may be calculated by equating the EPS of two plans as follows :

$$\frac{(\text{EBIT} - ₹\,30{,}000)(1-.3)}{2{,}000} = \frac{\text{EBIT}\,(1-.3)}{4{,}000}$$

$$\text{EBIT} = ₹\,60{,}000$$

The value of EBIT in the above equation is the indifferent level of EBIT and is found to be ₹ 60,000. At this level of EBIT, the EPS under the alternative plans would be same at ₹ 10.50.

Illustration 7.8

A new project under consideration requires a capital outlay of ₹ 300 lacs for which the funds can either be raised by the issue of equity shares of ₹ 100 each or by the issue of equity shares of the value of ₹ 200 lacs and by the issue of 15% loan of ₹ 100 lacs. Find out the indifference level of EBIT given the tax rate at 30%.

Solution :

In the financing plan I, the firm will be issuing 3 lacs equity shares. However, in financing plan II there will be 2 lacs equity shares and a loan of ₹ 100 lacs on which interest of ₹ 15 lacs would be payable. The indifferent level of EBIT may be ascertained as follows :

$$\frac{\text{EBIT}(1-.3)}{3{,}00{,}000} = \frac{(\text{EBIT}-15{,}00{,}000)\,(1-.3)}{2{,}00{,}000}$$

$$\text{EBIT} = ₹\,45{,}00{,}000$$

The value of EBIT in the above equation is the indifference level of EBIT and is found to be ₹ 45 lacs. At this level of EBIT, the EPS under both the plans would be same.

Illustration 7.9

The following data pertain to Forge Limited :

Existing capital structure : 10 lakh Equity Shares of ₹ 10 each

Tax Rate : 50 per cent

Forge Limited plans to raise additional capital of ₹ 100 lakhs for financing an expansion project. It is evaluating two alternative financing plans : (*i*) Issue of 10,00,000 equity shares of ₹ 10 each and (*ii*) Issue of ₹ 100 lakh debentures carrying 14 per cent interest.

You are required to compute indifference point.

Solution :

Plan I = 10,00,000 Equity shares to be issued as ₹ 10 each

Plan II = 14% Debenture of ₹ 100,00,000 to be issued.

Existing number of shares is 10,00,000

Indifference level of EBIT for these two financial plans may be found as follows :

$$\frac{\text{EBIT}\,(1-t)}{N_1} = \frac{(\text{EBIT} - \text{Int})\,(1-t)}{N_2}$$

where, N_1 = Number of Shares in Plan I

N_2 = Number of Shares in Plan II

Int = Interest payment in Plan II

Now, $$\frac{\text{EBIT}\,(1-.5)}{20{,}00{,}000} = \frac{(\text{EBIT} - 14{,}00{,}000)\,(1-.5)}{10{,}00{,}000}$$

$$10{,}00{,}000 \times .5\ \text{EBIT} = .5\ \text{EBIT}\,(20{,}00{,}000) - .5 \times 20{,}00{,}000 \times 14{,}00{,}000$$

$$\text{EBIT} = ₹\,28{,}00{,}000$$

So, indifference level of EBIT for two plans is ₹ 28,00,000.

Illustration 7.10

M Ltd. is considering a major expansion of its production facilities and want to raise ₹ 50 lakhs for the purpose. The following alternatives are available to raise the required amount:

(₹ in lacs)

Sources	**Alternatives**		
	A	**B**	**C**
Equity Share Capital	50	20	10
15% Debentures	—	20	15
16% Preference Share Capital	—	10	25

Expected Earning before interest and taxes is 25% of investment. The corporate tax rate is 40%. At present the company has no debt. Which of the alternative would you choose if the objective of the firm is to maximise the rate of return on Equity Capital?

Solution :

Calculation of Rate of Return on Equity Capital :

	Alternatives		
	A	*B*	*C*
Amount of Investment	₹ 50,00,000	₹ 50,00,000	₹ 50,00,000
Rate of Return	25%	25%	25%
EBIT	₹ 12,50,000	₹ 12,50,000	₹ 12,50,000
–Interest on Debenture @ 15%	—	3,00,000	2,25,000
Profit before tax	12,50,000	9,50,000	10,25,000
–Tax @ 40%	5,00,000	3,80,000	4,10,000
Profit after Tax	7,50,000	5,70,000	6,15,000
– Pref. Dividend @ 16%		1,60,000	4,00,000
Profit for Equity Shareholders	7,50,000	4,10,000	2,15,000
Equity Share Capital	50,00,000	20,00,000	10,00,000
Rate of Return on Equity Share Capital	15%	20.5%	21.5%

Alternative C is better, as the rate of return on equity share capital is highest in this case.

Illustration 7.11

From the following information available for 4 firms, calculate the EBIT, the EPS, the Operating leverage and the Financial leverage :

Solution :

	Firm P	**Firm Q**	**Firm R**	**Firm S**
Sales (in Units)	20,000	25,000	30,000	40,000
Selling price per unit (₹)	15	20	25	30

	Firm P	Firm Q	Firm R	Firm S
Variable cost per unit (₹)	10	15	20	25
Fixed costs (₹)	15,000	40,000	50,000	60,000
Interest (₹)	30,000	25,000	35,000	40,000
Tax %	30	30	30	30
Number of equity shares	5,000	9,000	10,000	12,000

Calculation of EBIT, EPS, Operating Leverage and Financial Leverage

	Firm P	Firm Q	Firm R	Firm S
Sales (in Units)	20,000	25,000	30,000	40,000
Contribution (₹ 5 per unit)	₹1,00,000	₹1,25,000	₹ 1,50,000	₹ 2,00,000
–Fixed costs	30,000	40,000	50,000	60,000
EBIT	70,000	85,000	1,00,000	1,40,000
–Interest	15,000	25,000	35,000	40,000
Profit before Tax	55,000	60,000	65,000	1,00,000
–Tax @ 30%	16,500	18,000	19,500	30,000
Profit after Tax	38,500	42,000	45,500	70,000
Number of equity shares	5,000	9,000	10,000	12,000
EPS (₹)	7.70	4.67	4.55	5.83
Operating Leverage : Contribution/EBIT	1.43	1.47	1.50	1.43
Financial Leverage : EBIT/Profit before Tax	1.27	1.42	1.54	1.40

Illustration 7.12

MC Ltd. is planning an expansion program which will require ₹ 30 crores and can be funded through one of the three following options :

1. Issue further equity shares of ₹ 100 each at par,
2. Raise a 15% loan, and
3. Issue 12% preference shares.

The present paid up capital is ₹ 60 crores and the annual EBIT is ₹ 12 crores. The tax rate may be taken at 30%. After the expansion plan is adopted, the EBIT is expected to be ₹ 15 crores.

Calculate the EPS under all the three financing options indicating the alternative giving the highest return to the equity shareholders. Also determine the indifference point between the equity share capital and the debt financing (*i.e.,* option 1 and option 2 above). *[B.Com. (H.) D.U., 2009]*

Solution :

Calculation of EPS under different options :

(₹ in crores)

	Option 1	Option 2	Option 3
EBIT	15.00	15.00	15.00
–Interest	—	4.50	—
Profit before Tax	15.00	10.50	15.00
–Tax @ 30%	4.50	3.15	4.50
Profit after Tax	10.50	7.35	10.50
–Pref. Dividend	—	—	3.60
Net Profit	10.50	7.35	6.90
Total No. of equity shares	90,00,000	60,00,000	60,00,000
EPS	₹ 11.67	₹ 12.25	₹ 11.50

The option 2 *i.e.,* financing by the issue of 15% loan is expected to give the highest EPS of ₹ 12.25. The indifference point of EBIT between the option 1 and option 2 may be ascertained as follows :

$$\frac{EBIT(1-t)}{N_1} = \frac{(EBIT-Int.)(1-.5)}{N_2}$$

$$\frac{EBIT(1-.3)}{90,00,000} = \frac{(EBIT-4.5\ Crores)(1-.3)}{60,00,000}$$

$$EBIT = 13.50\ crores$$

The value of EBIT in the above equation is the indifferent level of EBIT and is found to be ₹ 13.50 crores. At this level of EBIT the firm will have same EPS under the two financing options.

Illustration 7.13

Calculate EPS of Solid Ltd. and Sound Ltd. assuming (*a*) 20% Before Tax return on Assets, (*b*) 10% Before Tax return on Assets on the basis of the following data.

	Solid Ltd.	Sound Ltd.
Total Assets	₹ 1,00,00,000	₹ 1,00,00,000
Equity Share Capital (FV = ₹ 10 each)	1,00,00,000	50,00,000
12% Debt	—	50,00,000

Comment on the Financial Leverage of the firm assuming tax rate of 50%.

Solution :

The EPS of both the firms may be ascertained as follows:

	Solid Ltd.		Sound Ltd.	
	20% Return	10% Return	20% Return	10% Return
Total Assets	₹ 1,00,00,000	₹ 1,00,00,000	₹ 1,00,00,000	₹ 1,00,00,000
Rate of Return	20%	10%	20%	10%
EBIT	₹20,00,000	₹ 10,00,000	₹ 20,00,000	₹ 10,00,000
Less Interest	—	—	6,00,000	6,00,000
Profit before Tax	20,00,000	10,00,000	14,00,000	4,00,000
Less Tax @ 50%	10,00,000	5,00,000	7,00,000	2,00,000
Profit after Tax	10,00,000	5,00,000	7,00,000	2,00,000
No. of Equity Shares	10,00,000	10,00,000	5,00,000	5,00,000
EPS	₹ 1.00	₹ 0.50	₹ 1.40	₹ 0.40

Comments : Solid Ltd. does not have any financial leverage as there is no debt. So, the 50% decrease in EBIT (from 20% to 10%) result in decrease in EPS also by 50% (from ₹ 1 to ₹ 0.50) However, in case of Sound Ltd., there is a 50% leverage. For a decrease of 50% in EBIT from 20% to 10%, the EPS also decreases from ₹ 1.40 to ₹ 0.40 (*i.e.* a decrease of 71.4%). The financial leverage of the firm at 20% return level is :

$$FL = \frac{EBIT}{EBT} = \frac{20,00,000}{14,00,000} = 1.428$$

So, for 50% decrease in EBIT, the EPS would fall by $.50 \times 1.428 = .7142$ or 71.42%.

Illustration 7.14

(*b*) PQR Ltd. provides the following details :

Installed Capacity	1,50,000 units
Actual Production and Sales	1,00,000 units

Selling Price per unit	₹ 1
Variable Cost per unit	₹ 0.50
Fixed Cost	₹ 38,000
Funds required	₹ 1,00,000

	Financial Plans		
Capital Structure	**A**	**B**	**C**
Equity shares of ₹ 100 each to be issued at 25% premium	60%	40%	35%
15% Debt	40%	60%	50%
10% preference shares of ₹ 100 each	—	—	15%

Assume Income Tax rate 30%.

Calculate :

(*i*) Degree of Operating Leverage, Financial Leverage and Combined Leverage for each financial plan.

(*ii*) The Indifference point between Plan A and B.

(*iii*) The Financial break-even point for each plan and suggest which plan has more financial risk.

[B.Com. (H.) D.U., 2012]

Solution :

Calculation of EBIT :

Sales (1,00,000 units @ ₹1)	₹ 1,00,000
Less : Variable cost @ ₹ 0.50 p.u.	50,000
Contribution	50,000
Less : Fixed cost	38,000
EBIT (Operating Profit)	12,000

Statement of EPS

	Financing Plans		
	A	**B**	**C**
EBIT	12,000	12,000	12,000
Less : Interest (15%)	6,000	9,000	7,500
EBT	6000	3000	4,500
Less : Tax (30%)	1,800	900	1,350
EAT	4,200	2,100	3,150
Less : Preference dividend	–	–	1,500
Earning available for equity shareholders (NI)	4,200	2,100	1,650
No. of equity shares (N)	480	320	280
Operating Leverage (OL) = $\left(\frac{\text{Contribution}}{\text{EBIT}}\right)$	$\frac{50,000}{12,000} = 4.17$	$\frac{50,000}{12,000} = 4.17$	$\frac{50,000}{12,000} = 4.17$
Financial Leverage (FL) = $\frac{\text{EBIT}}{\text{EBT} - \frac{\text{PD}}{(1-t)}}$	$\frac{12,000}{6,000} = 2$	$\frac{12,000}{3} = 4$	$\frac{12,000}{4500 - \frac{1,500}{1-.3}} = 5.09$
Combined Leverage (OL × FL)	4.17 × 2 = 8.34	4.17 × 4 = 16.68	4.17 × 5.09 = 21.23

(*ii*) **Indifference Point between Plan A and B :**

$$\frac{(EBIT - I_1)(1-t)}{N_1} = \frac{(EBIT - I_2)(1-t)}{N_2}$$

$$\Rightarrow \frac{(EBIT - 6000)(1-0.30)}{480} = \frac{(EBIT - 9000)(1-0.30)}{320}$$

$$EBIT = ₹\ 15,000$$

(*iii*) **Financial Break-even level of EBIT :**

Plan A : Interest charges = ₹ 6000

Plan B : Interest charges = ₹ 9000

Plan C : Interest charges + $\frac{PD}{(1-t)}$

$$= 7500 + \frac{1500}{(1-0.30)} = ₹\ 9,643$$

Plan C having highest financial leverage has higher financial risk

Illustration 7.15

Following information is available in respect of PQR Ltd.

Equity Share Capital (F.V. ₹10 each)	₹32,00,000
12% Debentures	42,50,000
Fixed Cost	4,08,000
Operating Leverage	1.4
Combined Leverage	2.8
Sales	₹60,00,000
Tax rate	30%

Find out the Financial Leverage and EPS of the firm.

Solution:

Calculation of Financial Leverages:

$$CL = OL \times FL$$
$$2.8 = 1.4 \times FL$$
$$FL = 2$$

Calculation of EPS:

$$O.L = \frac{\text{Contribution}}{\text{EBIT}}$$
$$1.4 = \frac{\text{Contribution}}{\text{Contribution} - ₹4,08,000}$$
$$\text{Contribution} = 1.4\ \text{Contribution} - ₹5,71,200$$
$$\text{Contribution} = \frac{₹5,71,000}{.4} = ₹14,28,000$$
$$PAT = (\text{Contribution} - \text{Fixed Cost} - \text{Interest})(1-t)$$
$$= (14,28,000 - 4,08,000 - 5,10,000)\ (1 - .3)$$
$$= ₹3,57,000$$
$$EPS = \frac{PAT}{\text{No. of Equity Shares}} = \frac{₹\ 3,57,000}{3,40,000} = ₹1.12$$

Illustration 7.16

A new project is under consideration in XYZ Ltd., which requires a capital investment of ₹ 4.50 crore. Interest on Term loan is 12% and Corporate tax is 50%. If the Debt – Equity ratio insisted by the financing agencies is 2:1, calculate the point of indifference for the project. *[B.Com. (H.) D.U., 2014]*

Solution:

In the given case, the indifference level of EBIT can be calculated between the loan option (given) and the equity option (implied)

Loan Option:

Total funds	₹4,50,00,000
Debt–Equity Ratio	2:1
So, 12% Debt	₹ 3,00,00,000
Equity (FV = ₹10 each)	₹1,50,00,000

Equity Option :

Equity (F.V. = ₹10 each)	₹ 4,50,00,000

Indifference Level of EBIT:

$$\frac{(EBIT - ₹36,00,000)\ (1-.5)}{15,00,000} = \frac{(EBIT)\ (1-.5)}{45,00,000}$$
$$1.5\ EBIT - ₹54,00,000 = .5\ EBIT$$
$$EBIT = ₹\ 54,00,000$$

Illustration 7.17

Following is the Balance Sheet of MA Equipment Ltd.:

Capital & Liabilities	Amount	Assets	Amount
Equity Share Capital (₹ 10 each)	₹ 60,000	Fixed Assets	₹ 1,50,000
Reserves	20,000	Current Assets	90,000
10% Debt	80,000		
Current Liabilities	80,000		
	2,40,000		2,40,000

The Fixed Assets turnover of the firm is 4.

The fixed Operating Costs of the firm are ₹ 1,00,000 and the Variable Costs are 40%. The tax rate is 30%.

Find out (*i*) Different leverages for the firm.

(*ii*) Likely level of EBIT if the EPS is (*a*) ₹ 1, (*b*) ₹ 3

(*iii*) Financial break-even level.

Solution :

In order to find out the leverages, the Income Statement may be presented as follows :

Income Statement

Sales (1,50,000 × 4)	₹ 6,00,000
–Variable Cost (40%)	2,40,000
Contribution	3,60,000
–Fixed Cost	1,00,000
Operating Profit (EBIT)	2,60,000
– Interest (80,000 × 10%)	8,000
Profit before Tax (PBT)	2,52,000
–Tax (@) 30%	75,600
Profit After Tax (PAT)	1,76,400

Calculation of Leverages:

$$(i)\ \text{Operating Leverage} = \frac{\text{Contribution}}{\text{EBIT}} = \frac{3,60,000}{2,60,000} = 1.385$$
$$(ii)\ \text{Financial Leverage} = \frac{\text{EBIT}}{\text{PBT}} = \frac{2,60,000}{2,52,000} = 1.032$$
$$(iii)\ \text{Combined Leverage} = \frac{\text{Contribution}}{\text{PBT}} = \frac{3,60,000}{2,52,000} = 1.428$$

Calculation of Desired Level of EBIT :

$$EPS = \frac{(EBIT - Int.)\ (1-t)}{\text{No. of Equity Shares}}$$

For EPS = ₹ 1:

$$1 = \frac{(EBIT - 8,000)\ (1-.3)}{6,000}$$
$$6,000 = (EBIT - 8,000)\ (1-.3)$$
$$EBIT = ₹\ 16,571$$

For EPS = ₹ 3

$$3 = \frac{(EBIT - 8,000)\ (1-.3)}{6,000}$$
$$18,000 = (EBIT - 8,000)\ (1-.3)$$
$$EBIT = ₹\ 33,714$$

Financial Break-Even Level:

Financial Break-Even level is that level of EBIT at which EPS is 0.

$$\text{For EPS} = ₹0$$
$$0 = \frac{(EBIT - 8,000)(1-.3)}{6,000}$$
$$0 = (EBIT - 8,000)\ (1-.3)$$
$$EBIT = ₹\ 8,000$$

or, Financial Break Even Level of EBIT = Interest = ₹ 8,000

OBJECTIVE TYPE QUESTIONS

State whether each of the following statements is ***True (T)*** *or* ***False (F)****.*

(*i*) EBIT is also known as operating profits.

(*ii*) If EBIT for two firms are same, then the EPS of these firms would also always be same.

(*iii*) EPS depends upon the composition of capital structure.

(*iv*) Financial breakeven level occurs when EBIT is zero.

(*v*) At financial breakeven level of EBIT, EPS would be zero.

(*vi*) Indifference level of EBIT is one at which EPS is zero.

(*vii*) Indifference level of EBIT is one at which EPS under two or more financial plans would be same.

(*viii*) All equity plan and Debt-equity plan have no indifference level of EBIT.

(*ix*) Preference dividend is not a factor of indifference level of EBIT.

(*x*) EBIT-EPS Analysis is an extension of financial leverage analysis.

[**Answers :** *(i) T, (ii) F, (iii) T, (iv) F, (v) T, (vi) F, (vii) T, (viii) F, (ix) F, (x) T.*]

MULTIPLE CHOICE QUESTIONS

1. In order to calculate EPS, Profit after Tax and Preference Dividend is divided by :
   (*a*) MP of Equity Shares
   (*b*) Number of Equity Shares
   (*c*) Face Value of Equity Shares
   (*d*) None of the above.

2. Trading on Equity is :
   (*a*) Always beneficial
   (*b*) May be beneficial
   (*c*) Never beneficial
   (*d*) None of the above.

3. Benefit of 'Trading on Equity' is available only if :
   (*a*) Rate of Interest $<$ Rate of Return
   (*b*) Rate of Interest $>$ Rate of Return
   (*c*) Both (*a*) and (*b*)
   (*d*) None of (*a*) and (*b*).

4. Indifference Level of EBIT is one at which :
   (*a*) EPS is zero
   (*b*) EPS is Minimum
   (*c*) EPS is highest
   (*d*) None of these.

5. Financial Break-even level of EBIT is one at which :
   (*a*) EPS is one
   (*b*) EPS is zero
   (*c*) EPS is Infinite
   (*d*) EPS is Negative.

6. Relationship between change in Sales and change in Operating Profit is known as :
   (*a*) Financial Leverage
   (*b*) Operating Leverage
   (*c*) Net Profit Ratio
   (*d*) Gross Profit Ratio.

7. If a firm has no Preference share capital, Financial Break-even level is defined as equal to :
   (*a*) EBIT
   (*b*) Interest liability
   (*c*) Equity Dividend
   (*d*) Tax Liability.

8. At Indifference level of EBIT, different capital plans have :
   (*a*) Same EBIT
   (*b*) Same EPS
   (*c*) Same PAT
   (*d*) Same PBT.

9. Which of the following is not a relevant factor in EBIT-EPS Analysis of capital structure ?
   (*a*) Rate of Interest on Debt
   (*b*) Tax Rate
   (*c*) Amount of Preference Share Capital
   (*d*) Dividend paid last year.

10. For a constant EBIT, if the debt level is further increased then
   (*a*) EPS will always increase
   (*b*) EPS may increase
   (*c*) EPS will never increase
   (*d*) None of the above.

11. Between two capital plans, if expected EBIT is more than indifference level of EBIT, then
   (*a*) Both plans be rejected,
   (*b*) Both plans are good,
   (*c*) One is better than other,
   (*d*) None of the above.

12. Financial break-even level of EBIT is :
    (*a*) Intercept at Y-axis
    (*b*) Intercept at X-axis
    (*c*) Slope of EBIT-EPS line
    (*d*) None of the above.

[**Answers :** *1. (b), 2. (b), 3. (a), 4. (d), 5. (b), 6. (b), 7. (b), 8. (b), 9. (d), 10. (b), 11. (c), 12. (b)*]

ASSIGNMENTS

1. What is EBIT-EPS Analysis? How is it different from leverage analysis? *[B.Com.(H), D.U., 2013]*
2. Explain EBIT-EPS analysis. What is indifference level of EBIT? Show graphically.
3. What do you mean by financial break-even? How is it calculated?
4. Explain and illustrate the in difference level of EBIT
5. Explain the EBIT-EPS analysis of capital structure. Show graphically, the financial break-even level.
6. What are the shortcomings, if any, of the EBIT-EPS analysis?
7. Examine the effects of change in EBIT of a firm on the EPS under (*i*) same capital structure and (*ii*) different capital structure.
8. Explain the mechanism of determining the indifference level of EBIT under different combinations of optimal financing plans.
9. How the indifference level of EBIT be calculated in case of financing plans involving a pure equity financing and a plan comprising of equity and debt financing?
10. "Trading on equity is resorted with a view to decrease EPS". Comment. *[B.Com.(H), D.U., 2013]*

PROBLEMS

P6.1 A firm requires total capital funds of ₹ 25 lacs and has two options : All equity; and Half equity and Half 15% debt. The equity share can be currently issued at ₹ 100 per share. The expected EBIT of the company is ₹ 2,50,000 with tax rate at 30%. Find out the EPS under both the financial mix.

[*Answer :* ₹ 6 and ₹ 3.50 respectively.]

P6.2 AB Ltd. needs ₹ 10,00,000 for expansion. The expansion is expected to yield an annual EBIT of ₹ 1,60,000. In choosing a financial plan, AB Ltd. has an objective of maximising earnings per share. It is considering the possibility of issuing equity shares and raising debt of ₹ 1,00,000 or ₹ 4,00,000 or ₹ 6,00,000. The current market price per share is ₹ 25 and is expected to drop to ₹ 20 if the funds are borrowed in excess of ₹ 5,00,000. Funds can be borrowed at the rates indicated below: (*a*) up to ₹ 1,00,000 at 8%; (*b*) over ₹ 1,00,000 up to ₹ 5,00,000 at 12%; (*c*) over ₹ 5,00,000 at 18%. Assume a tax rate of 30%. Determine the EPS for the three financing alternatives.

[*Answer:* ₹ 2.96, ₹ 3.38 and ₹ 3.01.]

P6.3 The operating income of a textile firm amounts to ₹ 1,86,000. It pays 30% tax on its income. Its capital structure consists of the following :

15% Preference shares	₹ 1,00,000.
Equity shares (₹ 100 each)	4,00,000
14% Debentures	5,00,000

(*i*) Determine the firm's EPS.
(*ii*) Determine the percentage change in EPS associated with 30% change (both increase and decrease) in EBIT.
(*iii*) Determine the degree of financial leverage at the current level of EBIT.
(*iv*) What additional data do you need to compute operating as well as combined leverage?

[*Answer :* EPS ₹ 16.55 and Financial Leverage 1.97.]

P6.4 Three financing plans are being considered by ABC Ltd. which requires ₹ 10,00,000 for construction of a new plant. It wants to maximize the EPS and the current market price of the share is ₹ 30. It has a tax rate of 30% and debt financing can be arranged as follows : Up to ₹ 1,00,000 @ 10%; from ₹ 1,00,000 to ₹ 5,00,000 @ 14%; and over ₹ 5,00,000 @ 18%. The three financing plans and the corresponding EBIT are as follows :

Plan I: ₹ 1,00,000 debt; expected EBIT ₹ 2,50,000

Plan II: ₹ 3,00,000 debt; expected EBIT ₹ 3,50,000

Plan III: ₹ 6,00,000 debt; expected EBIT ₹ 5,00,000

Find out the EPS for all the three plans and suggest which plan is better from the point of view of the company.

[*Answer :* ₹ 5.60, ₹ 9.24 and ₹ 20.58. So, the Plan III may be selected.]

P6.5 A company's current EBIT is ₹ 20 lakh. Its present borrowings are :

14% Term loans	₹ 40,00,000
Working capital borrowings from banks at 16%	33,00,000
15% Public deposits	15,00,000

The sales of the company are growing, and to support them the company proposes to obtain an additional bank loan of ₹ 25 lakh. The increase in EBIT is expected to be 20%. Calculate the change in interest coverage ratio after the additional borrowing and comment.

[*Answer :* Interest Coverage Ratio reduces from 1.52 to 1.40.]

P6.6 A company is considering lowering the selling price of its product. The following information is available on the costs of producing and income from selling its product :

Number of units sold	3,00,000
Sale price	₹ 10 per unit
Variable costs	₹ 6 per unit
Fixed costs	₹ 6,00,000

The management has asked you to prepare a statement indicating the percentage increase in volume necessary to maintain a net operating income at the current level on product with decrease in price of 10% and 20% assuming other costs remaining constant.

[*Answer :* Desired sales are 4,00,000 units and 6,00,000 units.]

P6.7 AB Ltd. has decided to change its capital structure. The firm has one crore fully paid up equity shares. Market price of share ₹ 50 and is likely to remain the same even after proposed capital restructuring. The restructuring involves increasing the firm existing ₹ 9 crore 10% Debt to ₹ 14 crore.

The proceeds will be used to retire the equity. The interest rates on debt is not expected to change as the debt investors do not perceive the firm to become more risky. Company is in 40% tax bracket. Calculate that level of EBIT that the firm must earn so that EPS doesn't change.

[*Answer :* Indifference level of EBIT is ₹ 5,90,000.]

P6.8 The following information is available in respect of XYZ Ltd. :

Number of shares issued	10,000
Market price per share	₹ 20
Interest rate	12%
Tax rate	30%
Expected EBIT	₹ 15,000

The firm needs ₹ 50,000 for investment next year. Should the firm issue debt or equity to produce higher EPS. Also find out the indifference level of EBIT for the two alternatives? What is the EPS for that EBIT?

[*Answer :* EPS is ₹ 0.63 and 0.30; the indifference level of EBIT is ₹ 8,400 and the EPS at that level is ₹ 0.168.]

P6.9 A company needs ₹ 5,00,000 for construction of a new plant. The following three financial plans are feasible: (*i*) The company may issue 50,000 common shares at ₹ 10 per share, (*ii*) The company may issue 25,000 equity shares at ₹ 10 per share and 2,500 debentures of ₹ 100 bearing a 8% rate of interest, (*iii*) The company may issue 25,000 equity shares at ₹ 10 per share and 2,500 preference shares at ₹ 100 per share bearing a 8% rate of dividend. If the company's earnings before interest and taxes are ₹ 10,000, ₹ 20,000, ₹ 40,000, ₹ 60,000 and ₹ 1,00,000 what are the earnings per share under each of the three financial plans? Which alternative would you recommend and why? Determine the indifference points. Assume a corporate tax rate of 30%.

[*Answer :* Alternative I: EPS are ₹ 0.14, 0.28, 0.56, 0.84 and 1.20; Alternative II : EPS are ₹ –0.28, 0, 0.56, 1.12 and ₹ 2.24; Alternative III: EPS are ₹ –0.52,0, –0.24, 32, 0.88 and ₹ 2.00. Indifference level of EBIT between Alternatives I and II is ₹ 40,000 and between Alternatives I and III is ₹ 57,143.]

P6.10 A company requires capital funds of ₹ 5 crores and has two options : (*i*) To raise the amount by the issue of 15% debentures, and (*ii*) To issue equity shares at a rate of ₹ 20 per share. It already has 40 lacs equity shares issued and debt financing of ₹ 6 crores at the rate of 12%. Find out the expected EPS under both financing options at the given EBIT levels of ₹ 2 crores and ₹ 7.5 crores. What should be choice of the company given that the applicable tax rate is 30%.

[*Answer :* EPS of ₹ 0.93 and ₹ 10.35 for debt financing; and EPS of ₹ 1.38 and ₹ 7.30 for equity financing.]

CHAPTER

8

Leverage, Cost of Capital and Value of the Firm

"The theory of capital structure is closely related to the firm's cost of capital. Many debates over whether an 'optimal' capital structure exists are found in the financial literature. The debate began in the late 1950s, and there is as yet no resolution of the conflict. Theorists who assert the existence of an optimal capital structure are said to take a traditional approach, while those who believe such a capital structure does not exist are called supporters of the M and M Approach."[1]

SYNOPSIS

- Concept of Value of the Firm.
- Capital Structure and Cost of Capital.
- Net Income Approach : Capital Structure does Matter.
- Net Operating Income Approach : Capital Structure does not Matter.
- Traditional Approach : A Practical View Point.
- MM Hypothesis : Behavioural Explanation of NOI Approach.
  - The Arbitrage Process.
  - Cost of Equity Capital Under MM Model.
  - Critical Evaluation of MM Hypothesis.
- MM Hypothesis with Taxes.
- Graded Illustrations in Valuation of the Firm.

1. Gitman, Lawrence J., *Principles of Managerial Finance,* Harper and Row Publishers, New York, Fourth Edition, p. 480.

The discussion in the preceding two chapters on the Leverage Analysis and the EBIT-EPS Analysis, has shown that there is a relationship between the financial leverage and the earnings available to the equity shareholders. In case of favourable financial leverage, the increase in sales or more particularly the increase in EBIT, will have a magnifying effect on the EPS. The firm should select such a capital structure or financial leverage which will maximize the expected EPS. It is already seen that the basic objective of financial management is to maximize the shareholders wealth and therefore all financial decisions in any firm should be taken in the light of this objective. The decision regarding the capital structure or the financial leverage or the financing mix should also be based on the objective of achieving the maximization of shareholders wealth. The present chapter attempts to analyze the relationship between capital structure and the value of the firm in terms of different theories and models on the subject-matter.

Concept of Value of the Firm : The value of a firm depends on the earnings of the firm and the earnings of the firm depend upon the investment decisions of the firm. The earnings of the firm are capitalized at a rate equal to the cost of capital in order to find out the value of the firm. Thus, the value of the firm depends on two basic factor *i.e.*, the earnings of the firm and the cost of capital.

The operating profit of the firm *i.e.*, the EBIT is divided among three main claimants (*i*) the debt holders who receive their share in the form of interest, (*ii*) the Government which receives its share in the form of taxes and (*iii*) the shareholders who receive the residual. So, the EBIT is a pool which is to be divided among the three claimants. The investment decisions of the firm determine the size of the EBIT pool while the capital structure mix determines the way it is to be sliced. The total value of the firm is the sum of its value to the debt holders and to its shareholders and is determined by the amount of EBIT going to them respectively. The investment decision can therefore, increase the value of the firm by increasing the size of the EBIT whereas the capital structure mix can affect the value only by reducing the share of the EBIT going to the Government in the form of taxes.

The financing mix or the financial leverage or the capital structure does not affect the total earnings of the firm which is a factor of the investment decisions and the cost structure of the firm. However, the earnings available to the shareholders may be influenced by the capital mix as it is already seen that the financial leverage helps increasing the EPS for a given level of EBIT. The EPS on the other hand, affects the market value of the share and hence affects the value of the firm.

The overall cost of capital of the firm *i.e.*, the weighted average cost of capital, WACC, depends upon the specific cost of capital of individual sources of finance and the proportion of different sources in the total capital structure of the firm. One financing mix or capital structure is represented by one WACC which may change whenever there is change in the financing mix. So, a firm can change its WACC by changing the financing mix and can thus affect the value of the firm. It may be noted that the cost of capital and the value of the firm are inversely related. For a given level of earnings, lower the cost of capital, the higher would be the value of firm. But, what is the relationship between financing mix, cost of capital and value of the firm ? Is there an optimal capital structure ? Can the value of the firm be maximized by affecting the financing mix or by affecting the cost of capital ? If leverage affects the cost of capital and the value of the firm, then a firm should try to achieve an optimal capital structure or optimal financing mix and minimizing the cost of capital. Is there really a capital structure which may be called the optimal capital structure ?

CAPITAL STRUCTURE THEORIES

When the degree of debt financing is increased in the capital structure, the equity shareholders are exposed to higher degree of risk. This results from:

(*i*) The debt investors have first claim on the profits, and

(*ii*) In case of liquidation, the claim of the equity shareholders is only residual and arises only after payment to debt investors.

So, the degree of financial leverage has an impact on the returns to equity shareholders (discussed in the preceding chapter) and on the riskiness of the equity investment, effecting the market price of the equity or the value of the firm.

Divergent views have been expressed on the relationship between leverage, cost of capital and value of the firm. In fact, establishing the relationship between the leverage, cost of capital and value of the firm is one of the most controversial issue in financial management. Broadly speaking, different views on such relationship, known as theories of capital structure, can be studied and analyzed by grouping into :

(*i*) That capital structure matters for the valuation of the firm, presented by Net Income Approach.

(*ii*) That capital structure does not matter for the valuation of the firm, presented by Net Operating Income Approach, and

(*iii*) A more pragmatic approach between the two above, presented by Traditional Approach.

In addition, there is a Modigliani-Miller Model which provides justification for the Net Operating Income Approach. All the above approaches and M-M Model have been discussed in the present chapter. In order to understand the relationship between leverage, cost of capital and value of the firm, the following assumptions are made:

1. That there are only two sources of funds *i.e.*, the equity and the debt, which is having fixed interest.
2. That the total assets of the firm are given and there would be no change in the investment decisions of the firm.
3. That the firm has a policy of distributing the entire profits among the shareholders implying that there is no retained earnings.
4. The operating profits of the firm are given and are not expected to grow.

5. The business risk complexion of the firm is given and is constant and is not affected by the financing mix, and
6. That there is no corporate or personal taxes.

Further, in discussing the theories of capital structure, the following definitions and notations have been used :

E	=	Total Market Value of the Equity.
D	=	Total Market Value of the Debt.
V	=	Total Market Value of the Firm *i.e.,* D + E.
I	=	Total Interest Payment.
NOP	=	Net Operating Profit *i.e.,* EBIT.
NP	=	Net Profit or Profit after Tax (PAT).
D_0	=	Dividend Paid by the Company at Time 0 (*i.e.,* now).
D_1	=	Expected Dividend at the end of Year 1 (from now).
P_0	=	Current Market Price of the Share.
P_1	=	Expected Market Price of the Share after 1 Year.
k_d	=	After Tax Cost of Debt *i.e.,* [I (1–t)]/D.
k_e	=	Cost of Equity *i.e.,* D_1/P_0.
k_o	=	Overall Cost of Capital *i.e.,* WACC
	=	$[D/(D + E)]k_d + [E/(D + E)]k_e$
	=	$\frac{NOP}{V} = \frac{EBIT}{V}$

NET INCOME APPROACH : CAPITAL STRUCTURE MATTERS

The Net Income (NI) approach to the relationship between leverage, cost of capital and value of the firm is the simplest in approach and explanation. As suggested by Durand, this theory states that there is a relationship between capital structure and the value of the firm and therefore, the firm can affect its value by increasing or decreasing the debt proportion in the overall financing mix. The NI approach makes the following additional assumptions :

1. That the total capital requirement of the firm are given and remain constant.
2. That k_d is less than k_e.
3. Both k_d and k_e remain constant and increase in financial leverage *i.e.,* use of more and more debt financing in the capital structure does not affect the risk perception of the investors.

The NI approach starts from the argument that change in financing mix of a firm will lead to change in WACC, k_0, of the firm resulting in the change in value of the firm. As k_d is less than k_e, the increasing use of cheaper debt (and simultaneous decrease in equity proportion) in the overall capital structure will result in the magnified returns available to the shareholders. The increased returns to the shareholders will increase the total value of the equity and thus increases the total value of the firm. The WACC, k_o, will decrease and the value of the firm will increase. On the other hand, if the financial leverage is reduced by the decrease in the debt financing, the WACC, k_o, of the firm will increase and the total value of the firm will decrease. The NI approach to the relationship between leverage cost of capital has been presented graphically in Figure 8.1

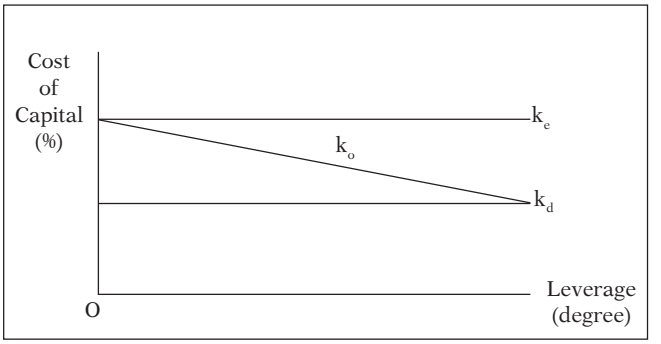

FIGURE 8.1 : NET INCOME APPROACH TO COST OF CAPITAL

The Figure 8.1 shows that the k_d and k_e are constant for all levels of leverages *i.e.,* for all levels of debt financing. As the debt proportion or the financial leverage increases, the WACC, k_o, decreases as the k_d is less than k_e. This result in the increase in value of the firm. In the Figure 8.1 it may be noted that k_o will approach k_d as the debt proportion is increased. However, k_o will never touch k_d as there cannot be a 100% debt firm. Some element of equity must be there. However, if the firm is 100% equity firm, then the k_o is equal to k_e. The rate of decline in k_o depends upon the relative position of k_d and k_e. Net Income Approach suggests that higher the degree of leverage, better it is, as the value of the firm would be higher. In other words, a firm can increase its value just by increasing the debt proportion in the capital structure.

The NI approach may be illustrated with the help of Example 8.1.

Example 8.1

The expected EBIT of a firm is ₹ 2,00,000. It has issued Equity Share capital with k_e @ 10% and 6% Debt of ₹ 5,00,000. Find out the value of the firm and the overall cost of capital, WACC.

Solution:

EBIT	₹ 2,00,000
–Interest	30,000
Net Profit	1,70,000
k_e	10%
Value of equity, E, = 1,70,000/.10	17,00,000
Value of debt, D,	5,00,000
Total value of the firm, V,	22,00,000
WACC, k_o,	EBIT/V
	= 2,00,000/22,00,000
	= .09 or 9%

The WACC can also be calculated as follows :

$$\begin{aligned} \text{WACC} &= [D/(D+E)]k_d + [E/(D+E)]k_e \\ &= [5/(5+17)].06 + [17/(5+17)].10 \\ &= .09 \text{ or } 9\%. \end{aligned}$$

Now, if the firm has issued 6% Debt of ₹ 7,00,000 instead of ₹ 5,00,000, the position would have been as follows :

EBIT	₹ 2,00,000
–Interest	42,000
Net Profit	1,58,000
k_e	10%
Value of equity, E, = 1,58,000/.10	15,80,000
Value of debt, D,	7,00,000
Total value of the firm, V,	22,80,000
WACC, k_o,	EBIT/V
=	2,00,000/22,80,000
=	.087 or 8.7%

So, when the 6% Debt is increased from ₹ 5,00,000 to ₹ 7,00,000, the value of the firm increases from ₹ 22,00,000 to ₹ 22,80,000 and WACC decreases from 9% to 8.7%. Now, say the firm has issued 6% debt of ₹ 2,00,000 only instead of ₹ 5,00,000, the position would be as follows:

EBIT	₹ 2,00,000
–Interest	12,000
Net Profit	1,88,000
k_e	10%
Value of equity, E, = 1,88,000/.10	18,80,000
Value of debt, D,	2,00,000
Total value of the firm, V,	20,80,000
WACC, k_o,	EBIT/V
=	2,00,000/20,80,000
=	.096 or 9.6%

So, when the proportion of 6% Debt is reduced to ₹ 2,00,000 only, the value of the firm reduces to ₹ 20,80,000 and the WACC increases from 9% to 9.6%. Thus, as per the NI approach, a firm is able to increase its value and to decrease its WACC by increasing the debt proportion in the capital structure.

The effect of changing proportions of debt on the market price of the share can also be analyzed. Presently, the value of the equity, E, is ₹ 17,00,000 and the firm has 1,00,000 equity shares outstanding. So, the market price of the share would be ₹ 17. Now, if the firm increases its debt proportion from ₹ 5,00,000 to ₹ 7,00,000 and uses the proceed to retire 11,764.70 shares (*i.e.,* ₹ 2,00,000/₹ 17) of the firm. In this case, the total value of the equity is ₹ 15,80,000 (already calculated) represented by 88,235.30 shares or the market price of ₹ 17.90 per share (₹ 15,80,000/88,235.30). The EPS in this case, would be ₹ 1.79 (*i.e.,* ₹ 1,58,000/88,235.30) giving 10% yield on the market price of ₹ 17.90.

However, if the firm wishes to reduce the debt from ₹ 5,00,000 to ₹ 2,00,000, it will be required to issue additional shares at the market price of ₹ 17. The number of new shares to be issued is ₹ 3,00,000/17=17,647.05, making total number of outstanding shares to be 1,17,647.05. In this case, the total market value of the equity shares is ₹ 18,80,000 and the market price of the share would be ₹ 15.98 and the EPS would be ₹ 1.59 giving a yield of 10% on the market price. Thus, the market price of the share also moves in line with the value of the firm in response to the variations in debt proportion of the capital structure. Under NI Approach, the value of the firm can be defined as :

Value of Firm = Value of Equity + Value of Debt.

Conclusion : *The NI approach, though easy to understand, it is too simple to be realistic. It ignores, perhaps the most important aspects of leverage, that the market price depends upon the risk which varies in direct relation to the changing proportion of debt in the capital structure.*

NET OPERATING INCOME APPROACH : CAPITAL STRUCTURE DOES NOT MATTER

The Net Operating Income (NOI) approach is opposite to the NI approach. This is also known as Independence Hypothesis. According to the NOI approach, the market value of the firm depends upon the net operating profit or EBIT and the overall cost of capital, WACC. The financing mix or the capital structure is irrelevant and does not affect the value of the firm. The NOI approach makes the following assumptions :

1. The investors see the firm as a whole and thus capitalizes the total earnings of the firm to find the value of the firm as a whole.
2. The overall cost of capital, k_o, of the firm is constant and depends upon the business risk which also is assumed to be unchanged.
3. The cost of debt, k_d, is also taken as constant.
4. The use of more and more debt in the capital structure increases the risk of the shareholders and thus results in the increase in the cost of equity capital *i.e.,* k_e. The increase in k_e is such as to completely offset the benefits of employing cheaper debt, and
5. That there is no tax.

The NOI approach is based on the argument that the market values the firm as a whole for a given risk complexion. Thus, for a given value of EBIT, the value of the firm remain same irrespective of the capital composition and instead depends on the overall cost of capital. The value of the Equity may be found by deducting the value of debt from the total value of the firm *i.e.,*

$$V = \frac{EBIT}{k_0} \qquad (8.1)$$

$$\text{and} \quad E = V - D$$

and the cost of equity capital, k_e, is :

$$k_e = \frac{\text{EBIT} - \text{Interest}}{V - D} \quad (8.2)$$

Thus, the financing mix is irrelevant and does not affect the value of the firm. The value remains same for all types of Debt-equity mix. Since there will be change in risk of the shareholders as a result of change in Debt-equity mix, therefore, the k_e will be changing linearly with change in debt proportions. The NOI approach to the relationship between the leverage and cost of capital has been presented in Figure 8.2.

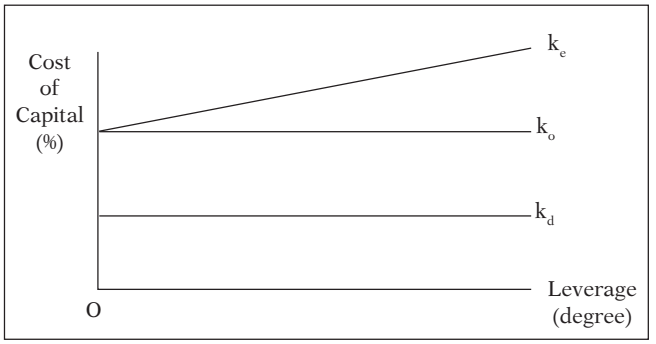

FIGURE 8.2 : THE NOI APPROACH TO COST OF CAPITAL.

Figure 8.2 shows that the cost of debt, k_d, and the overall cost of capital, k_o, are constant for all levels of leverage. As the debt proportion or the financial leverage increases, the risk of the shareholders also increases and thus the cost of equity capital, k_e, also increases. However, the increase in k_e, is such that the overall value of the firm remains same. It may be noted that for an all-equity firm, the k_e, is just equal to k_o. As the debt proportion is increased, the k_e also increases. However, the overall cost of capital remains constant because increase in k_e is just sufficient to off-set the benefits of cheaper debt financing.

The NOI approach considers k_o to be constant and therefore, there is no optimal capital structure; rather every capital structure is as good as any other and every capital structure is an optimal one. The NOI approach can be explained with the help of Example 8.2.

Example 8.2

A firm has an EBIT of ₹ 2,00,000 and belongs to a risk class of 10%. What is the value of cost of equity capital if it employs 6% debt to the extent of 30%, 40% or 50% of the total capital fund of ₹ 10,00,000.

Solution :

The effect of changing debt proportion on the cost of equity capital can be analyzed as follows :

	30% Debt	40% Debt	50% Debt
EBIT	₹ 2,00,000	₹ 2,00,000	₹ 2,00,000
k_o	10%	10%	10%
Value of the firm, V	₹ 20,00,000	₹ 20,00,000	₹ 20,00,000
Value of 6% debt, D	3,00,000	4,00,000	5,00,000
Value of equity, (E=V–D)	17,00,000	16,00,000	15,00,000
Net profit (EBIT-Interest)	1,82,000	1,76,000	1,70,000
k_e, NP/E	10.7%	11%	11.33%

The k_e of 10.7%, 11% and 11.33% can be verified for different proportion of debt by calculating WACC, k_o, as follows:

For 30% debt, $k_o = [D/(D + E)]k_d + [E/(D + E)]k_e$
$= [3/(3 + 17)].06 + [17/(3 + 17)].107$
$= 10\%.$

For 40% debt, $k_o = [D/(D + E)]k_d + [E/(D + E)]k_e$
$= [4/(4 + 16)].06 + [16/(4 + 16)].11$
$= 10\%.$

For 50% debt, $k_o = [D/(D + E)]k_d + [E/(D + E)]k_e$
$= [5/(5 + 15)].06 + [15/(5 + 15)].113$
$= 10\%.$

These calculations of WACC testify that the benefit of employment of more and more debt in the capital structure is off set by the increase in equity capitalization rate, k_e. The above analysis shows that under the NOI Approach, the value of the firm is found by capitalizing the EBIT at the rate of k_o and from this value, the value of debt is deducted to find out the value of the equity. This can be stated as follows :

Value of Equity = Value of Firm – Value of Debt.

The NOI suggests that total market value of the firms' outstanding securities is not affected by the manner in which different long-term sources of funds have been tapped. In other words, the sum of the market value of the debt and equity will always be same regardless of how much or little debt is used by the company. So, one capital structure is as good as any other. The same is also suggested by the risk-return trade off principle that investors do not take on additional risk unless compensated with additional return. This means that using more debt by a company will not be ignored by the investors who will require a higher return on equity share capital to be compensated for the increased uncertainty stemming from the addition of the debt securities in the capital structure.

TRADITIONAL APPROACH : A PRACTICAL VIEWPOINT

The NI and the NOI approach hold extreme views on the relationship between the leverage, cost of capital and the value of the firm. In practical situations, both these approaches seem to be unrealistic. The traditional approach takes a compromising view between the two and incorporates the basic philosophy of both. It takes a mid way between the NI approach (that the value of the firm can be increased by increasing the leverage) and the NOI approach (that the value of the firm is constant irrespective of the degree of financial leverage).

As per the traditional approach, a firm should make a judicious use of both the debt and the equity to achieve a capital structure which may be called the optimal capital structure. At this capital structure, the overall cost of capital, WACC, of the firm will be minimum and the value of the firm maximum.

The Traditional view states that the value of the firm increases with increase in financial leverage but up to a certain limit only. Beyond this limit, the increase in financial leverage will increase its WACC also, and the value of the firm will decline.

Under the Traditional approach, the cost of debt, k_d, is assumed to be less than the cost of equity, k_e. In case of 100% equity firm, k_o is equal to the k_e but when (cheaper) debt is introduced in the capital structure and the financial leverage increases, the k_e remains same as the equity investors expect a minimum leverage in every firm. The k_e does not increase even with increase in leverage. The argument for k_e, remaining unchanged may be that up to a particular degree of leverage, the interest charge may not be large enough to pose a real threat to the dividend payable to the shareholders. This constant k_e and k_d makes the k_o to fall initially. Thus, it shows that the benefits of cheaper debts are available to the firm. But this position does not continue when leverage is further increased.

The increase in leverage beyond a limit increases the risk of the equity investors also and as a result the k_e, also starts increasing. However, the benefits of use of debt may be so large that even after offsetting the effects of increase in k, the k_o may still go down or may become constant for some degree of leverages. If firm increases the leverage further, then the risk of the debt investor may also increase and consequently the k_d also starts increasing. The already increasing k_e and the now increasing k_d makes the k_o to increase. Therefore, the use of leverage beyond a point will have the effect of increase in the overall cost of capital of the firm and thus results in the decrease in value of the firm.

Thus, there is a level of financial leverage in any firm, up to which it favourably affects the value of the firm but thereafter if the leverage is increased further, then the effect may be adverse and the value of the firm may decrease. There may be a particular leverage or a range of leverage which separates the favourable leverage from the unfavourable leverage. The traditional view point has been shown in the Figure 8.3.

The Figure 8.3 shows that there can either be a particular financial leverage (as in Part A) or a range of financial leverage (as in Part B) when the overall cost of capital, k_o is minimum. The figure in Part A shows that at the financial leverage level O, the firm has the lowest k_o and therefore, the capital structure at that financial leverage is optimal. The Part B of the figure shows that there is not one optimal capital structure, rather there is a range of optimal capital structure from leverage level O to level P. Every capital structure over this range of financial leverage is an optimal capital structure.

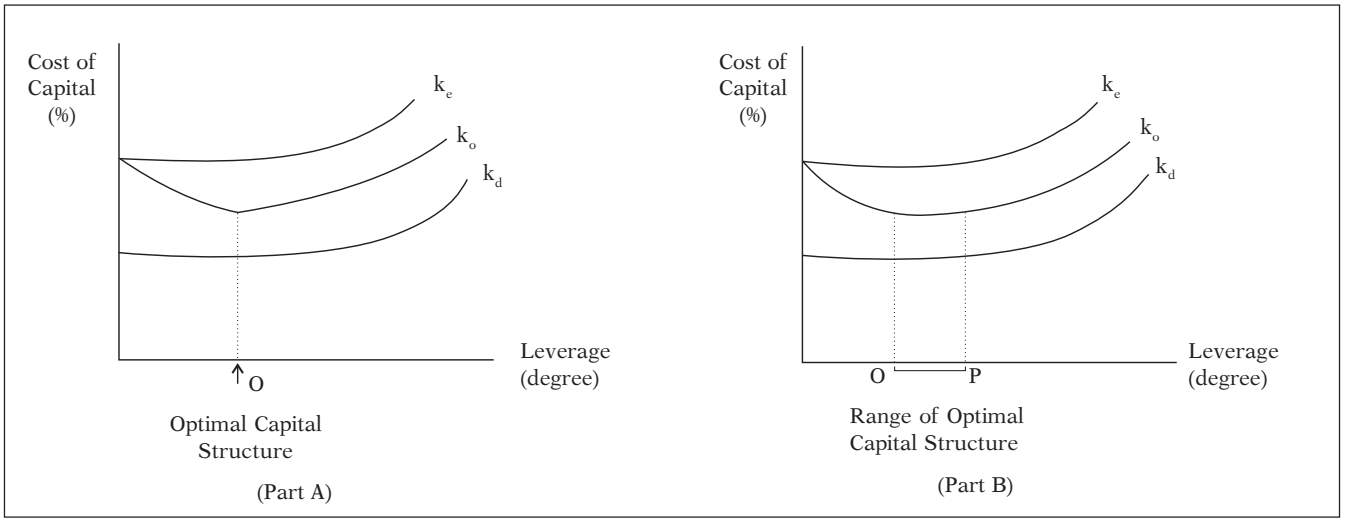

FIGURE 8.3 : TRADITIONAL VIEWPOINT ON THE RELATIONSHIP BETWEEN LEVERAGE, COST OF CAPITAL AND THE VALUE OF THE FIRM.

Thus, as per the Traditional approach, a firm can be benefited from a moderate level of leverage when the advantages of using debt (having lower cost) outweigh the disadvantages of increasing k_e (as a result of higher financial risk). The overall cost of capital, k_o, therefore is a function of the financial leverage. The value of the firm can be affected therefore, by the judicious use of debt and equity in the capital structure.

Example 8.3

ABC Ltd. having an EBIT of ₹ 1,50,000 is contemplating to redeem a part of the capital by introducing debt financing. Presently, it is a 100% equity firm with equity capitalization rate, k_e, of 16%. The firm is to redeem the capital by introducing debt financing up to ₹ 3,00,000 *i.e.*, 30% of total funds or up to ₹ 5,00,000 *i.e.*, 50% of total funds. It is expected that for the debt financing up to 30%, the rate of interest will be 10% and the k_e will increase to 17%. However, if the firm opts for 50% debt financing, then interest will be payable at the rate of 12% and the k_e, will be 20%. Find out the value of the firm and its WACC under different levels of debt financing.

Solution :

On the basis of the information given, the total funds of the firm seems to be of ₹ 10,00,000 (whole of which is provided by the equity capital) out of which 30% or 50% *i.e.*, ₹ 3,00,000 or ₹ 5,00,000 may be replaced by the issue of debt bearing

interest at 10% or 12% respectively. The value of the firm and its WACC may be ascertained as follows :

	0% Debt	30% Debt	50% Debt
Total Debt	–	₹ 3,00,000	₹ 5,00,000
Rate of Interest	–	10%	12%
EBIT	₹ 1,50,000	1,50,000	1,50,000
–Interest	–	30,000	60,000
Profit before Tax	1,50,000	1,20,000	90,000
Equity capitalization rate, k_e	.16	.17	.20
Value of Equity, E	9,37,500	7,05,882	4,50,000
Value of Debt	–	3,00,000	5,00,000
Total Value	9,37,500	10,05,882	9,50,000
k_o (EBIT/Total Value)	.16	.149	.158

Example 8.3 shows that with the increase in leverage from 0% to 30%, the firm is able to reduce its WACC from 16% to 14.9% and the value of the firm increases from ₹ 9,37,500 to ₹ 10,05,882. This happens as the benefits of employing cheaper debt are available and the k_e does not rise too much. However, thereafter, when the leverage is increased further to 50%, the cost of debt as well as the cost of equity, both, rise to 12% and 20% respectively. The equity investors have increased the equity capitalization rate to 20% as they are now finding the firm to be more risky (as a result of 50% leverage). The increase in cost of debt and the equity capitalization rate has increased the k_o and hence as a result the value of the firm has reduced from ₹ 10,05,882 to ₹ 9,50,000 and k_o has increased from 14.9% to 15.8%.

However, in spite of the arguments presented above there is a school of thought which says that capital structure decisions do not really affect the value of the firm. The NOI approach, already discussed, emphasizes this aspect. The same has further been substantiated in one of the most influential papers ever written in corporate finance, containing one of the corporate finance's best known model, the Modigliani-Miller model.

MODIGLIANI-MILLER MODEL: BEHAVIOURAL JUSTIFICATION OF THE NOI APPROACH

The present section examines the Modigliani-Miller Model (MM) which was presented in 1958 on the relationship between the leverage, cost of capital and the value of the firm. They have maintained that under a given set of assumptions, the capital structure and its composition has no effect on the value of the firm. MM Model shows that the financial leverage does not matter and the cost of capital and value of firm are independent of the capital structure. There is nothing which may be called the optimal capital structure, they have, in fact, restated the NOI approach and have added to it the behavioural justification for their model. The MM Model is based on the following assumptions:

1. The capital markets are perfect and complete information is available to all the investors free of cost. The implication of this assumption is that investors can borrow and lend funds at the same rate and can move quickly from one security to another without incurring any transaction cost.
2. The securities are infinitely divisible.
3. Investors are rational and well-informed about the risk-return of all the securities.
4. All the investors have same probability distribution about the expected future earnings.
5. There is no corporate income-tax. (However, this assumption was relaxed later).
6. The personal leverage and the corporate leverage are perfect substitute.

On the basis of these assumptions, the MM Model derived that :

(*a*) The total value of the firm is equal to the capitalized value of the operating earnings of the firm. The capitalization is to be made at a rate appropriate to the risk class of the firm.

(*b*) The total value of the firm is independent of the financing mix *i.e.*, the financial leverage.

(*c*) The cut-off rate for the investment decision of the firm depends upon the risk class to which the firm belongs, and thus is not affected by the financing pattern of these investment.

MM Model can be discussed in terms of two propositions : I and II.

MM Proposition I: Proposition I states that it is completely irrelevant how a firm arranges its capital funds.

MM model argues that if two firms are alike in all respect except that they differ in respect of their financing pattern and their market value, then the investors will develop a tendency to sell the shares of the over valued firm (creating a selling pressure) and to buy the shares of the under valued firm (creating a demand pressure). This, buying and selling pressures will continue till the two firms have same market values. MM model can be further explained with the help of an example as follows :

Suppose, there are two firms, LEV & Co. and ULE & Co. These firms are alike and identical in all respect except that the LEV & Co. is a levered firm and has 10% debt of ₹ 30,00,000 in its capital structure. On the other hand, the ULE & Co. is an unlevered firm and has raised funds only by the issue of equity share capital. Both these firms have an EBIT of ₹ 10,00,000 and the equity capitalization rate k_e, of 20%. Under these parameters, the total value and the WACC of both the firms may be ascertained as follows :

	LEV & Co.	ULE & Co.
EBIT	₹ 10,00,000	₹ 10,00,000
–Interest	3,00,000	–
Net Profit	7,00,000	10,00,000
Equity capitalization rate, k_e	.20	.20

	LEV & Co.	ULE & Co.
Value of Equity	35,00,000	50,00,000
Value of Debt	30,00,000	–
Total Value, V,	65,00,000	50,00,000
WACC, k_o=EBIT/V,	15.38%	20%

Though, both the LEV & Co. and ULE & Co. have same EBIT of ₹ 10,00,000 and same k_e of 20% and still the LEV & Co., the levered firm, has a lower k_o and higher value as against the ULE & Co., which is an unlevered firm. MM argue that this position cannot persist for a long and soon there will be an equality in the values of the two firms. They have suggested an arbitrage mechanism to prove their hypothesis. This arbitrage process, as seen in the following discussion, provides the behavioural justification of the model.

The Arbitrage Process : The arbitrage process refers to undertaking by a person of two related actions or steps simultaneously in order to derive some risk- less benefit *e.g.*, buying by a speculator in one market and selling the same at the same time in some other market; or selling one type of investment and investing the proceed in some other investment. The profit or benefit from the arbitrage process may be in any form : increased income from the same level of investment or same income from lesser investment. This arbitrage process has been used by MM to testify their hypothesis of financial leverage, cost of capital and value of the firm.

In order to understand the working of the arbitrage process, the above example of LEV & Co. *etc.* may be taken. Suppose, an investor is a holder of 10% equity share capital of LEV & Co. The value of his ownership right is ₹ 3,50,000 *i.e.*, 10% of ₹ 35,00,000. Further, that out of the total net profits of ₹ 7,00,000 of LEV & Co., he is entitled to 10% *i.e.*, ₹ 70,000 per annum and getting a return of 20%, his k_e, on his worth. In order to avail the opportunity of making a profit, he now decides to convert his holdings from LEV & Co. to ULE & Co. He disposes off his holding in LEV & Co. for ₹ 3,50,000, but in order to buy 10% holding of ULE & Co., he requires total funds of ₹ 5,00,000, whereas his proceeds are only ₹ 3,50,000. So, he takes a loan @ 10% of an amount equal to ₹ 3,00,000 (*i.e.*, 10% of the debt of the LEV & Co.) and now he is having total funds of ₹ 6,50,000 (*i.e.*, the proceeds of ₹ 3,50,000 and the loan of ₹ 3,00,000).

Out of the total funds of ₹ 6,50,000, he invests ₹ 5,00,000 to buy 10% shares of ULE & Co. Still he has funds of ₹ 1,50,000 available with him. Assuming that the ULE & Co. continues to earn the same EBIT of ₹ 10,00,000, the net returns available to the investor from the ULE & Co. are :

Profit Available from ULE & Co. (being 10% of net profit)	₹ 1,00,000
–Interest payable @ 10% on ₹ 3,00,000 loan	30,000
Net Return	70,000

So, the investor is able to get the same return of ₹ 70,000 from ULE & Co. also, which he was receiving as an investor of LEV & Co., but he has funds of ₹ 1,50,000 left over for investment elsewhere. Thus, his total income may now be more than ₹ 70,000 (inclusive of some income on the investment of ₹ 1,50,000). Moreover his risk is the same as before. Though his new outlet *i.e.*, ULE & Co., is an unlevered firm (hence no risk) but the position of the investor is levered because he has created a homemade leverage by borrowing ₹ 3,00,000 from the market. In fact, he has replaced the corporate leverage of LEV&Co., by his personal leverage.

The above example shows that the investor who originally owns a part of the levered firm and enter into the arbitrage process as above, will be better off selling the holding in levered firm and buying the holding in unlevered firm using his home made leverage.

MM model argues that this opportunity to earn extra income through arbitrage process, will attract so many investors. The gradual increase in sales of the shares of the levered firm, LEV & Co., will push its prices down and the tendency to purchase the shares of unlevered firm, ULE & Co., will drive its prices up. These selling and purchasing pressures will continue until the market value of the two firms are equal. At this stage, the value of the levered and the unlevered firm and also their cost of capital are same; and thus the overall cost of capital, k_o, is independent of the financial leverage.

The arbitrage process described above involves a transfer of investment from a levered firm to unlevered firm. This arbitrage process will work in the reverse direction also, when the value of the levered firm is less than the value of the unlevered firm. Say, the total value of LEV&Co. is ₹ 45,00,000 (consisting of ₹ 30,00,000 debt capital and ₹ 15,00,000 equity share capital), and the value of the ULE&Co. is the same as before, *i.e.*, ₹ 50,00,000. Now, the investor holding 10% share capital of ULE & Co. sells his ownership right for ₹ 5,00,000. Out of these proceeds, he buys 10% of share capital of LEV&Co. for ₹ 1,50,000 and invests ₹ 3,00,000 (*i.e.*, 10% of ₹ 30,00,000) in 10% Government Bonds. Still he will be having funds of ₹ 50,000 with him and his position in respect of incomes from two firms would be as under :

	ULE & Co.	LEV & Co.
10% of Profits	₹ 1,00,000	₹ 70,000
10% Interest on Bonds	-	30,000
Total Income	₹ 1,00,000	₹ 1,00,000

Thus, by performing the arbitrage process, the investor will not only be able to maintain his income level, but also be having additional cash flows of ₹ 50,000 at his disposal. The prices of the share of ULE & Co. and LEV & Co. must adjust until the values of both the firms are equal.

MM Proposition II: Proposition II states that the cost of equity depends upon three factors *i.e.*, overall cost of capital of the firm, cost of debt and the firm's debt equity ratio. In MM model, there is a linear relationship between the cost of equity and the leverage (as measured by the Debt-equity ratio *i.e.*, D/E). When the leverage is increased, the earnings available for the equity shareholder will increase, but the cost of equity will also increase as a result of increase in financial risk. The benefits of increasing leverage are completely offset by the increase in cost of equity capital and consequently the market value of the firm remains same.

As per the MM Model, the cost of equity capital, k_e, is :

$$k_e = k_o + (k_o - k_d)(D/E) \quad (8.3)$$

i.e., k_e for the given risk class is equal to the fixed overall cost of capital, k_o, plus a premium for the financial risk. It may be noted that in the Equation 13.3, k_d, is the cost of debt of levered firm. As there is an assumption of no corporate taxes, k_d is equal to the rate of interest on debt employed by the firm.

For example, ABC & Co. has raised equity capital of ₹ 30,00,000 and 10% debt of ₹ 20,00,000. It belongs to a risk class having overall cost of capital, k_o, of 18%. The cost of equity capital, k_e, for the firm is

$$\begin{aligned} k_e &= k_o + (k_o - k_d)(D/E) \\ &= .18 + (.18 - .10)(2/3) \\ &= .233 \text{ or } 23.3\%. \end{aligned}$$

If, however, the company issues additional debt of ₹ 10,00,000, the debt-equity ratio will be 1:1 and the k_e, will be :

$$\begin{aligned} k_e &= .18 + (.18 - .10)(1/1) \\ &= .26 \text{ or } 26\%. \end{aligned}$$

So, the overall cost of capital, k_o, remain same, but with the increase in financial leverage, the risk premium of equity shareholders has increased from 5.3% to 8%. The k_o can also be verify as follows :

If debt equity ratio is 2:3, then

$$\begin{aligned} k_o &= [D/(D+E)]k_d + [E/(D+E)]k_e \\ &= [2/(2+3)].10 + [3/(2+3)].233 \\ &= 18\%. \end{aligned}$$

If debt equity ratio is 1:1, then

$$\begin{aligned} k_o &= [D/(D+E)]k_d + [E/(D+E)]k_e \\ &= [1/1+1].10 + [1/1+1].26 \\ &= 18\%. \end{aligned}$$

Thus, it means that, as per MM model, the overall cost of capital, k_o, will not rise even if the degree of financial leverage is increased.

Critical Evaluation of MM Model : If the financing decision is irrelevant as shown by the MM Model, then the financial analysis relating to financial decision is so simplified. The overall cost of capital, which is the weighted average of the cost of debt and cost of equity, is unaffected by the changes in proportion of debt and equity. This might seem unreasonable, especially as the cost of debt is lower than the cost of equity. As per the MM Model, however, any benefits of substituting cheaper debt for more expensive equity are offset by increase in both the costs.

Theoretically speaking, the MM model, that there is no relationship between the leverage and the value of the firm, seems to be good enough in the light of the assumptions underlying the model. However, most of these assumptions are unrealistic and untenable. Moreover, the arbitrage process, which provides the behavioural justification for the model, is itself questionable in the real life as the perfect competition is never found and the transaction costs are inevitable. The validity of the model, on practical considerations, can be examined as follows :

1. **Non-substitutability of Personal and Corporate Leverages :** Under the MM model, the arbitrage mechanism operates on the assumption that the personal leverage of the investor and the corporate leverage are perfect substitute. However, this may not be true in real life. There may be difference in the effects of personal leverage and the corporate leverage, and it may be substantiated as follows :

   (*a*) *Different Borrowing Rates for the Corporates and the Individuals:* The arbitrage process presupposes that an individual investor is able to borrow funds at the same rate of interest at which the leverage firm can and hence the personal home made leverage of the individual investor is a perfect substitute of the corporate leverage. An individual cannot borrow or lend funds at the same rate at which a corporate firm can. However, a corporate entity having better credit standing in the market can definitely borrow at rates lower than the rates which an individual has to pay.

   (*b*) *Personal Gearing* versus *Corporate Gearing :* In the arbitrage process, when an investor takes a personal loan, he creates a personal gearing and then purchases shares of unlevered firm. So, as a result, the gearing has shifted from the corporate leverage to the personal leverage of the investor. Are these two gearings substitute ? When an investor borrows funds in his personal capacity, he in fact incurs an unlimited liability towards the lender. However, as a shareholder of the levered firm, his liability is limited only to the capital subscribed irrespective of the level of borrowings by the firm. So, the personal leverage is not a substitute of the corporate gearing.

   (*c*) *Leverage Capacity :* The firms usually have a higher leverage capacity as compared to the leverage capacity of the individuals. The creditors may not lend, to an individual, beyond a particular level.

   (*d*) *Inconveniences of Personal Leverage :* Borrowings either by firms or by an individual involve a lot of formalities and inconveniences. An individual investor may have a preference for corporate borrowing, because in this case, he will remain an outsider to the act of borrowing. Thus, the personal leverage may not at all be sufficient replacement for corporate leverage.

   So, the factors such as difference in borrowings/lending rates, risk exposure of personal and corporate leverage in terms of liability of the investors, the leverage capacity of the individuals and the firms and the inconveniences of borrowings do not make the personal leverage as a perfect substitute of corporate leverage. Hence, the efficiency of the arbitrage process in particular, and the MM model in general, is questionable.

2. **Transaction Costs :** The assumption of no transaction costs of the MM model is also imaginary. The buying and selling of shares by the investors will surely involve some transaction costs which will make the arbitrage process to stop short of completion. Though, the quantum of trans-

action costs will generally be small, yet the efficiency of the arbitrage process will be affected.

3. **Institutional Investor :** If an institution or a firm is a shareholder in a levered firm which is valued higher in the market, can this institutional investor take benefit by the arbitrage mechanism? Generally, it cannot. The reason being that the institutional investor may not be allowed to create a 'Personal' leverage and then to buy the shares of unlevered firm.
4. **Availability of Complete Information :** In real life, the assumption that all the investors have complete information, is also illusory. However, this assumption is compulsory otherwise the very emergence of the arbitrage process will become impossible. The arbitrage process requires that the investors have complete information about the levered and unlevered firm.
5. **Corporate Taxes :** The MM Model is based on the assumption that there is no corporate tax. This assumption is also unrealistic and the tax aspects of the levered firm is very significant in practice. Out of two alike firms differing only in respect of leverage, the levered firm will definitely have higher cash profit to be distributed among the shareholders as compared to an unlevered firm. This is particularly due to the fact that the interest is tax deductible. This will result in higher value of the levered firm than the value of the unlevered firm.

MM also agreed in their later analysis that the leverage may increase the value of the firm. The effect of corporate taxes on the value of the firm can be explained with the help of an example. Say, A Ltd. and B Ltd., both alike in all respect, except that out of total capital fund of ₹ 10,00,000, B Ltd. has raised ₹ 5,00,000 by the issue of 10% debenture. Both the firms have to pay tax @ 30%. The position of their EBIT and its appropriation under two types of economic conditions have been shown as follows :

	A Ltd.		B Ltd.	
Eco. Condition	**Average**	**Good**	**Average**	**Good**
EBIT	₹ 50,000	₹ 1,50,000	₹ 50,000	₹ 1,50,000
–Interest	–	–	50,000	50,000
Profit before Tax	50,000	1,50,000	–	1,00,000
–Tax @ 30%	15,000	45,000	–	30,000
Profit after Tax	35,000	1,05,000	–	70,000
Total Cash flow for Debt and Equity shareholders	35,000	1,05,000	50,000	1,20,000

From this table, it can be seen that A Ltd. (unlevered firm) has a tax liability of ₹ 15,000 and ₹ 45,000 in case of average and good economic conditions respectively; whereas B Ltd. (levered firm), having same level of EBIT of ₹ 50,000 and ₹ 1,50,000, has to pay only zero, or ₹ 30,000 taxes in average and good economic conditions respectively.

So, for B Ltd., having 50% leverage in its capital structure, the tax liability becomes smaller under both types of economic conditions. Therefore, use of leverage reduces the portion of EBIT going out as taxes. Similarly, the two groups of investors *i.e.*, the debt holders and the shareholders of the firm, who collectively determine the total value of the firm, also receive a larger share of EBIT in case of leverage firm than their share in the unlevered firm. The cash flow to the total investors of A Ltd. and B Ltd. are ₹ 35,000 and ₹ 50,000 under average economic conditions; and ₹ 1,05,000 and ₹ 1,20,000 under good economic conditions. This is because of the fact that the interest is tax-deductible in case of the levered firm.

The excess cash flow available to the investors of a levered firm can be calculated as interest charged × tax rate *i.e.*, ₹ 50,000 × .30 = ₹ 15,000. This is the difference between the cash flows from levered firm and unlevered firm (*i.e.*, ₹ 1,20,000 – ₹ 1,05,000). This difference of ₹ 15,000 is also known as **Interest Tax-Shield**.

The total market value of a firm increases with leverage as the cash flows available to total investor also increases with increase in leverage. Higher the leverage used by a firm, the larger will be the cash available for the investors and higher will be the value of the firm. The value of the unlevered firm is found by capitalizing the profit after tax at the overall cost of capital, k_o. However, in order to find out the value of the levered firm, the extent of interest tax-shield is to be calculated. The value of the levered and unlevered firm will differ only with respect to this interest tax-shield which will be available to the investor of the levered firm perpetually (on the assumption of permanent levered capital structure). So, the present value of the perpetuity of this interest tax-shield is added to the value of the unlevered firm to find out the value of the unlevered firm.

Under MM Model, the value of levered firm is found out as follows :

First, find out the value of the unlevered firm by capitalizing the profit after tax *i.e.*, EBIT × (1 – t), at the overall cost of capital.

$$V_u = \frac{EBIT(1-t)}{k_o}$$

In the above equation, the value of EBIT will be equal to PBT because in an unlevered firm, there will not be any interest liability. Then, the present value of the perpetuity of interest tax-shield is added to this value, V_u, to find out the value of the levered firm.

$$V_L = V_u + \text{PV of Interest Tax-shield}$$

The PV of interest tax-shield is calculated by discounting the interest tax-shield at an appropriate rate.

Now, value of levered firm can be defined as:

$$V_L = V_U + \text{Debt} \times (t) \qquad (8.4)$$

In the above formulations, the following notations have been used.

V_L = Value of the Levered firm
V_U = Value of the Unlevered firm
Debt = Total debt raised by the levered firm, and
t = Tax rate.

Thus, the value of the levered firm under MM model (after incorporating the corporate taxes) will be higher than the value of the unlevered firm.

Example 8.4

ABC Ltd. is an unlevered firm having total assets of ₹ 50,00,000 (all represented by share capital of ₹ 50,00,000) and equity capitalization rate, k_e, (which is also, k_o, for the unlevered firm) of 10%. It has an EBIT of ₹ 10,00,000 subject to corporate tax @ 30%. The value of the firm ABC Ltd. is :

$$V_U = \frac{₹\ 10,00,000\ (1–.3)}{.10} = ₹\ 70,00,000$$

There is another firm XYZ Ltd. also having total assets of ₹ 50,00,000 and alike in all respects to ABC Ltd. except that XYZ Ltd. has issued 5% debt of ₹ 20,00,000. The total market value of XYZ Ltd. is more than the value of ABC Ltd. by an amount equal to Debt × (t). Thus, the value of ABC Ltd. is :

$$V_L = V_U + \text{Debt(t)}$$
$$= ₹\ 70,00,000 + 20,00,000(.3) = ₹\ 76,00,000.$$

In this case, the market value of the equity is ₹ 56,00,000 (*i.e.,* ₹ 76,00,000 – 20,00,000). The cost of equity, k_e, can be ascertained as follows :

$$k_e = k_o + (k_o – k_d)[D(1 – t)/E] \quad (8.5)$$
$$= .10 + (.10–.05)[₹\ 20,00,000(.7)/56,00,000]$$
$$= .10 + .0125 = 11.25\%$$

It may be noted that in the Equation 8.5, k_d is the rate of interest paid by the levered firm. The benefit of debt financing (*i.e.,* tax shield of interest) has been incorporated in the Debt-Equity ratio.

The overall cost of capital of the firm can now be calculated as follows:

$$k_o = [D/(D + E)]k_d(1–t) + [E/(D + E)]k_e$$
$$= [20/(20 + 56)].05(.7) + [56/(20 + 56)].1125$$
$$= 9.21\%.$$

The value of k_o can also be calculated as :

$$k_o = \frac{₹\ 10,00,000\ (1–.3)}{₹\ 76,00,000} = 9.21\%$$

Thus, the position of the levered firm ABC Ltd. and the unlevered firm XYZ Ltd. can be summarized as follows :

	EBIT (₹)	Tax Rate	k_o	k_e	Value (₹)
ABC Ltd.	10,00,000	30%	10.00%	10.00%	70,00,000
XYZ Ltd.	10,00,000	30%	9.21%	11.25%	76,00,000

So, with reference to corporate taxes, the value of the levered firm is more than the value of the unlevered firm even under MM model. The results of the analysis of MM model can be summarised as follows :

MM Model without Taxes

1. That the firm's capital structure is irrelevant.
2. The WACC is the same no matter what mixture of debt and equity is used to finance the firm.
3. Total value of the firm is independent of the level of debt in the capital structure, and the value can be calculated by capitalizing the operating profit at appropriate rate. The value of the levered firm is equal to the value of the unlevered firm, and
4. Cost of equity, $k_e = k_o + (k_o – k_d)$ (D/E). The cost of equity in a levered firm is equal to the overall capitalization rate of the unlevered firm plus a premium for the financial risk. It implies that the cost of equity rises as the firm increases its use of debt.

MM Model with Taxes

1. The value of the levered firm is equal to the value of unlevered firm + the present value of the interest tax shield, *i.e.,*

   $V_L = V_u + D(t)$

   So, debt financing is advantageous and it increases the value of the firm.
2. The WACC of the firm decreases, as the firm relies more and more on debt financing.
3. The cost of Equity, $k_e = k_o + (k_o – k_d)$ (D/E) (1–t)
   or $= k_o + (k_o – k_d)[D(1–t)/E]$

   where, k_o is the WACC of the unlevered firm.

POINTS TO REMEMBER

- The relationship between capital structure, cost of capital and value of the firm has been one of the most debated area of financial management.
- There have been several questions raised : Can the value of the firm be affected by changing the capital mix? Is there a capital structure which may be called the optimal capital structure?
- Broadly speaking, differing views on the relationship between capital structure and value of the firm can be grouped into (*i*) That capital structure matters for the value of the firm, and (*ii*) That the capital structure does not matter.
- The Net Income Approach argues that a change in financing mix efforts the WACC, k_o, of the firm and thereby also effects the value of the firm. Higher the degree of debt, higher would be the value of the firm.
- The Net Operating Income Approach argues that the capital mix is irrelevant and does not affect the value, of the firm. The value on the other hand, depends upon the EBIT. The value of the firm may be found by capitalizing the EBIT at the capitalization rate for the risk class of the firm. Therefore, any capital mix is as good as any other.
- Modigliani-Miller have provided a behavioural justification for the NOI approach through the arbitrage process. However, in later analysis, they have agreed that the value of the levered firm may be more than unlevered firm because the former has the tax advantage of interest payment.
- The Traditional Approach, takes a middle way and argues that leverage may increase the value of the firm but to a certain degree only and therefore, a judicious use of debit-equity mix can help maximizing the value of the firm.

GRADED ILLUSTRATIONS

Illustration 8.1

S. Ltd. and T. Ltd. are in the same risk class and are identical in all respects except that company S uses debt while company T does not use debt. The levered firm has ₹ 9,00,000 debentures carrying 10% rate of interest. Both the firms earn 20% operating profit on their total assets of ₹ 15 lakhs. The company is in the tax bracket of 35% and capitalisation rate of 15% on all equity shares.

You are required to compute the value of S Ltd. and T Ltd. using Net Income approach. [*B.Com. (H.), D.U., 2012*]

Solution :

Calculation of Value of S. Ltd. and T. Ltd. using Net Income Approach

	S. Ltd.	T. Ltd.
Total Assets	₹ 15,00,000	₹ 15,00,000
Operating Profits	20%	20%
EBIT	₹ 3,00,000	₹ 3,00,000
– Interest	90,000	—
Profit before tax	2,10,000	3,00,000
– Tax @ 35%	73,500	1,05,000
Profit after tax	1,36,500	1,95,000
Equity Capitalization rate, k_e	15%	15%
Value of E (PAT/k_e)	₹ 9,10,000	₹ 13,00,000
Value of D	9,00,000	—
Total Value of the firm	18,10,000	13,00,000

Note : In the given case, the tax rate has been applied to find out the value of the Equity. It may be noted that Net Income Approach assumes that taxes are not there. So, in the given case, value of firm, without tax can also be calculated.

Illustration 8.2

Aparna Steel Ltd. has employed 15% debt of ₹ 12,00,000 in its capital structure. The net operating income of the firm is ₹ 5,00,000 and has an equity capitalization ratio of 16%. Assuming that there is no tax, find out the value of the firm under the NI Approach.

Net operating income	₹ 5,00,000
Less Interest on Debt	₹ 1,80,000
Earnings for Equity Investors	₹ 3,20,000
Equity Capitalization rate	16%
Value of Equity (3,20,000 ÷ .16)	₹ 20,00,000
Value of Debt	12,00,000
Total value of the firm	32,00,000

Illustration 8.3

OI Ltd. belongs to a risk class of 10% and expects EBIT of ₹ 4,00,000. It employs 8% debt in the capital structure. Find out the value of the firm and cost of equity capital k_e if it employs debt the extent of 20%, 35% or 50% of the total financial requirement of ₹ 20,00,000.

Solution :

Statement of Value of the firm and cost of Equity Capital :

	20% Debt	35% Debt	50% Debt
Total Capital	₹ 20,00,000	₹ 20,00,000	₹ 20,00,000
8% Debt	4,00,000	7,00,000	10,00,000
EBIT	₹ 4,00,000	₹ 4,00,000	₹ 4,00,000
– Interest on Debt	32,000	56,000	80,000
Net Profit for Equity, NP	3,68,000	3,44,000	3,20,000
Value of Firm, V=(EBIT÷10%)	₹ 40,00,000	₹ 40,00,000	₹ 40,00,000
– Value of Debt. D	4,00,000	7,00,000	10,00,000
Value of Equity, E	36,00,000	33,00,000	30,00,000
Cost of Equity, k_e = (NP÷E)	10.22%	10.42%	10.67%

Illustration 8.4

The net operating profit of a firm is ₹ 2,10,000 and the total market value of its 12% debt is ₹ 3,00,000. The equity capitalization rate of an unlevered firm of the same risk class is 16%. Find out the value of the levered firm given that the tax rate is 30% for both the firms.

Solution :

In order to find out the value of the levered firm, first, the value of unlevered firm should be found.

$$\text{Value of unlevered firm} = \frac{\text{EBIT}\,(1-t)}{k_e}$$

$$= \frac{2,10,000\,(1-.3)}{.16} = ₹\ 9,18,750$$

Now, value of levered firm = Value of unlevered firm + D(t)

$$= 9,18,750 + 3,00,000\,(.3)$$

$$= ₹\ 10,08,750$$

Illustration 8.5

ABC Ltd. with EBIT of ₹ 3,00,000 is evaluating a number of possible capital structures, given below. Which of the capital structure will you recommend and why ?

Capital Structure	Debt (₹)	k_d%	k_e%
I	3,00.000	10.0	12.0
II	4,00,000	10.0	12.5
III	5,00,000	11.0	13.5
IV	6,00,000	12.0	15.0
V	7,00,000	14.0	18.0

Solution :

In this case, the k_d and k_e of the firm are given and changing. The firm may adopt that capital structure which has the least overall cost of capital or the maximum value. The overall cost of capital, k_o, of the firm may be calculated by applying the Traditional Approach as follows :

k_o = EBIT/Total Market Value

Particulars	Plan I	Plan II	Plan III	Plan IV	Plan V
EBIT	₹ 3,00,000	₹ 3,00,000	₹ 3,00,000	₹ 3,00,000	₹ 3,00,000
–Interest	30,000	40,000	55,000	72,000	98,000
Net Profit	2,70,000	2,60,000	2,45,000	2,28,000	2,02,000
K_e	0.120	0.125	0.135	0.150	0.180
Mkt. value of Eq.	22,50,000	20,80,000	18,14,815	15,20,000	11,22,222
Mkt. value of Debt	3,00,000	4,00,000	5,00,000	6,00,000	7,00,000
Total Mkt. value	25,50,000	24,80,000	23,14,815	21,20,000	18,22,222
Overall C/C,k_e	11.76%	12.10%	12.95%	14.15%	16.46%

The capital structure (Plan I) having ₹ 3,00,000 of debt has the lowest cost of capital and consequently the highest market value, should be accepted.

Illustration 8.6

Two companies are identical except that A Ltd. has a debt of ₹ 10,00,000 at 10% whereas B Ltd. does not have debt in its capital structure. The total assets of both the companies A and B are same *i.e.*, ₹ 20,00,000 on which each company earns 20% return. Find the value of each company and overall cost of capital using net operating income (NOI). Approach Equity capitalisation rate for B Ltd. is 15%. The tax rate is 30%.

[B.Com. (H.) D.U., 2011]

Solution :

Net Operating Income Approach (With Taxes):

$$\text{Value of B Ltd. (Unlevered)} = \frac{EBIT(1-t)}{k_e} = \frac{4,00,000(.7)}{.15}$$

$$= ₹\ 18,66,667$$

$$\text{Value of A Ltd. (Levered)} = V_B + D(t)$$

$$= ₹\ 18,66,667 + 10,00,000\ (.3)$$

$$= ₹\ 21,66,667$$

Calculation of Overall Cost of Capital :

$$k_0\ (\text{B Ltd.}) = k_0 = 15\%$$

$$k_0\ (\text{A Ltd.}) = \frac{EBIT(1-t)}{V_A} = \frac{4,00,000(1-.3)}{21,66,667}$$

$$= 12.92$$

Illustration 8.7

XYZ Ltd. has Earnings before Interest and Taxes (EBIT) of ₹ 4,00,000. The firm currently has outstanding debts of ₹ 15,00,000 at an average cost, k_d, of 10%. Its cost of equity capital k_e, is estimated to be 16%.

(*i*) Determine the current value of the firm using the Traditional valuation approach,

(*ii*) Determine the firm's overall capitalization rate, k_o.

(*iii*) The firm is considering to issue capital of ₹ 5,00,000 in order to redeem ₹ 5,00,000 debt. The cost of debt is expected to be unaffected. However, the firm's cost of equity capital is to be reduced to 14% as a result of decrease in leverage. Would you recommend the proposed action ?

Solution :

(*i*) **Value of the firm (Traditional approach) :**

EBIT	₹ 4,00,000
–Interest (10% on ₹ 15,00,000)	1,50,000
Net income for Equity holders	2,50,000
k_e (Equity capitalization rate)	0.16
Market value of Equity	15,62,500
Market value of Debt	15,00,000
Total Market value	30,62,500

(*ii*) **Overall capitalization rate :**

$$k_o = \frac{EBIT}{V} = \frac{₹\ 4,00,000}{₹\ 30,62,500} = 13.1\%$$

(*iii*) **Effect of proposed Redemption of Debt:**

EBIT	₹ 4,00,000
–Interest (10% on ₹ 10,00,000)	1,00,000
Net Income	3,00,000
k_e (Equity capitalization rate)	0.14
Market value of Equity	21,42,857
Market value of Debt	10,00,000
Total Market value	31,42,857
k_o	12.73%

The proposal should be accepted as it would increase the value of the firm from ₹ 30,62,500 to ₹ 31,42,857. The cost of capital will also be reduced from 13.1% to 12.73%.

Illustration 8.8

The following estimates of the cost of debt and cost of equity capital have been made at various level of the debt-equity mix for ABC Ltd.

% of Debt	Cost of Debt	Cost of Equity
0	5.0%	12.0%
10	5.0%	12.0%
20	5.0%	12.5%
30	5.5%	13.0%
40	6.0%	14.0%
50	6.5%	16.0%
60	7.0%	20.0%

Assuming no tax, determine the optimal debt equity ratio for the company on the basis of the overall cost of capital, WACC.

Solution :

The overall cost of capital, WACC, may be defined as :

$$WACC = [k_d(D/D + E) + k_e(E/D + E)]$$

The WACC for the firm may be calculated as follows :

k_d%	k_e%	D/(D + E)	E/(D + E)	k_o%
5.0	12.0	0.0	1.0	12.00
5.0	12.0	0.1	0.9	11.30
5.0	12.5	0.2	0.8	11.00

k_d%	k_e%	D/(D + E)	E/(D + E)	k_o%
5.5	13.0	0.3	0.7	10.75
6.0	14.0	0.4	0.6	10.80
6.5	16.0	0.5	0.5	11.25
7.0	20.0	0.6	0.4	12.20

The optimal debt equity mix for the company occurs at a point when the overall cost of capital, k_o, is minimum. The above calculations show that the k_o is minimum at a point when the debt is 30% of the total capital employed. Therefore, the firm should use 30% debt and 70% equity in its capital structure and its k_o would be 10.75%.

Illustration 8.9

The following information is available for X Ltd. and Y Ltd. in respect of their present position. Compute the equilibrium values (v) and equity capitalization rate of the two companies, assume that (*i*) there is no income tax, and (*ii*) the overall rate of capitalization for such companies in the market is 12.5%.

	X	Y
EBIT	₹ 1,50,000	₹ 1,50,000
–Interest @ 5%	20,000	–
Net income for equity holders	1,30,000	1,50,000
Equity capitalization rate	.13	.12
Market value of Equity, E	10,00,000	12,50,000
Market value of Debt	4,00,000	–
Total Market value	14,00,000	12,50,000
Cost of Capital k_o, (EBIT/ Market Value)	10.71%	12%

Solution:

In order to find out the equilibrium value of the firm, the EBIT of both the firm should be capitalised at k_O, and then bifurcated into value of debt and value of equity as follows :

	X	Y
EBIT	₹ 1,50,000	₹ 1,50,000
Overall capitalization rate k_o	12.5%	12.5%
Total value of the firm	12,00,000	12,00,000
–Market value of the Debt	4,00,000	–
Market value of Equity, E	8,00,000	12,00,000
Earnings for Equity holders, NP	1,30,000	1,50,000
k_e (Equity capitalization rate), (NP÷E)	16.25%	12.5%

The firm X has higher k_e and is having debt in its capital structure while the firm Y does not have any debt.

Illustration 8.10

The following is the data regarding two companies X and Y belonging to the same risk class:

	Company X	Company Y
Number of ordinary shares	90,000	1,50,000
Market price per share (₹)	1.20	1.00
6% Debentures (₹)	60,000	—
Profit before interest (₹)	18,000	18,000

All profits after debenture interest are distributed as dividends.

Explain how under Modigliani & Miller approach, an investor holding 10% of shares in Company X will be better off in switching his holding to Company Y.

Solution :

Both the firms have EBIT of ₹ 18,000. Company X has to pay interest of ₹ 3,600 (*i.e.*, 6% on ₹ 60,000) and the remaining profit of ₹ 14,400 is being distributed among the shareholders. The Company Y, on the other hand, has no interest liability and therefore, is distributing ₹ 18,000 among the shareholders. The investor will be well off under MM model, by selling the shares of X and shifting to shares of Y company through the arbitrage process as follows :

If he sell shares of X company, he gets ₹ 10,800, 9000 shares @ ₹ 1.20 per share. He now takes a 6% loan of ₹ 6,000 (*i.e.*, 10% of ₹ 60,000) and out of the total cash of ₹ 16,800, he purchases 10% of shares of Company Y for ₹ 15,000. His position with regard to income from Company X and Company Y would be as follows :

	Company X	Company Y
Dividends (10% of profits)	₹ 1,440	₹ 1,800
–Interest (6% on ₹ 6,000)	-	360
Net Income	1,440	1,440

Thus, by shifting from Company X to Company Y, the investor is able to get same income of ₹ 1,440 and still having funds of ₹ 1,800 (*i.e.*, ₹ 16,800–15,000) at his disposal. He is better off, not in terms of income, but in terms of having capital funds of ₹ 1,800 with him, which he can invest elsewhere.

Illustration 8.11

From the following selected data, determine the value of the firms, P and Q belonging to the homogeneous risk class.

	Firm P	Firm Q
EBIT	₹ 2,25,000	₹ 2,25,000
Interest at 15%	75,000	—
Equity capitalization rate, k_e,	20%	
Corporate tax	30%	

Which of the two firms has an optimal capital structure under the NOI approach? *[B.Com. (H.), D.U., 2018]*

Solution :

Valuation of the firm (Net Operating Income approach):

The NOI approach is based on the assumptions that there is no tax. However, in the present case, both the firms have tax liability @ 30%. So, their valuation may be found by applying the MM model (with taxes) which is an extension of NOI approach. Under the MM Model, the value of levered firm is taken as equal to the value of unlevered firm plus the premium for interest tax shield on debt financing. Thus,

$$V_L = V_U + \text{Debt}(t)$$

where, V_L refers to the value of levered firm, V_U refers to value of unlevered firm and 't' refers to the tax rate applicable to the levered firm.

Valuation of Firm Q (Unlevered Firm):

$$V_Q = EBIT(1-.3)/k_e$$
$$= ₹\,2,25,000(.7)/.20$$
$$= ₹\,7,87,500$$

Now, the valuation of Firm P (Levered Firm) is :

$$V_p = V_Q + Debt(t)$$
$$= ₹\,7,87,500 + 5,00,000(.30)$$
$$= ₹\,9,37,500$$

Now, the value of Equity is ₹ 9,37,500–5,00,000=₹ 4,37,500, and the equity capitalization rate k_e = ₹ 1,05,000/4,37,500=24%. The overall capitalization rate, k_o, may be found as follows :

$$= 10.5\% \frac{₹\,5,00,000}{₹\,9,37,500} + 24\% \frac{₹\,4,37,500}{₹\,9,37,500} = 5.60\% + 11.20\% = 16.80\%$$

So, the WACC of firm P is 16.80%. The Firm P seems to have the optimal Capital structure as it is having higher total value than the value of the Firm Q.

Illustration 8.12

Companies U and L are identical in every respect except that the former does not use debt in its capital structure, while the latter employs ₹ 6,00,000 of 15% debt. Assuming that (*a*) all the MM assumptions are met, (*b*) the corporate tax rate is 30%, (*c*) the EBIT is ₹ 2,00,000, and (*d*) the equity capitalization of the unlevered company is 20%, what will be the value of the firms, U and L? Also determine the weighted average cost of capital for both the firms.

Solution : Under MM Model, the value of a firm may be found as follows :

Value of Unlevered firm, V_U:

$$V_U = \frac{EBIT(1-t)}{K_e} = \frac{₹\,2,00,000(1-.3)}{0.20} = \frac{1,40,000}{0.20} = ₹\,7,00,000$$

Value of Levered firm, V_L:

$$V_L = V_U + Debt(t) = ₹\,7,00,000 + ₹\,6,00,000(0.3)$$
$$= ₹\,8,80,000$$

k_o of unlevered firm (U) = 20% ($k_e = k_o$)

k_o of levered firm (L) :

EBIT	₹ 2,00,000
–Interest	90,000
Profit before Tax	1,10,000
–Taxes @ 30%	33,000
PAT	77,000
Total market value, V	8,80,000
–Market value of Debt	6,00,000
Market value of Equity, E	2,80,000

$$k_e = \frac{PAT}{E} = \frac{₹\,77,000}{2,80,000} = 27.5\%$$

$$k_o = 10.5\% \times \frac{₹\,6,00,000}{₹\,8,00,000} + 27.50\% \times \frac{₹\,2,80,000}{₹\,8,80,000} = 15.91\%$$

Illustration 8.13

The expected annual net operating income of a company is ₹ 10,00,000. The company has ₹ 50,00,000, 10% debentures. The overall cost of capital is 12.5%. Calculate the value of the firm and cost of equity according to NOI Approach.

If the company increases the debt from ₹ 50,00,000 to ₹ 60,00,000, what would be the value of the firm ?

Solution :

Calculation of value of the Firm (NOI Approach)

Net Operating Profit (EBIT)	₹ 10,00,000
WACC, k_o	.125
Value of Firm, V, (EBIT/k_o)	₹ 80,00,000
Value of Debt, D	50,00,000
Value of Equity, E	30,00,000
k_e = (EBIT – Int.) ÷ E = (5,00,000 ÷ 30,00,000)	16.67%
If the debt increases to ₹ 60,00,000:	
Value of the Firm, F	₹ 80,00,000
Value of Debt, D	60,00,000
Value of Equity, E	20,00,000
k_e (4,00,000 ÷ 20,00,000)	20%

So, as per NOI, the value of the firm remains at ₹ 80,00,000 but the value of equity decreases to ₹ 20,00,000. Consequently, the k_e also increases from 16.67% to 20%.

Illustration 8.14

Two companies V and L, belong to same risk class. These two firms are identical in all respect except that V company is unlevered while Co. L has 10% debentures of ₹ 5,00,000. The other relevant data regarding their valuation and capitalisation rates are as follows :

Particulars	*L* (₹)	*V* (₹)
EBIT	1,00,000	1,00,000
Less : Interest	50,000	—
Earnings available to Equity-holders	50,000	1,00,000
Equity capitalisation rate	0.16	0.125
Market value of Equity	3,12,500	8,00,000
Market value of Debt	5,00,000	—
Total Market value	8,12,500	8,00,000
Overall Cost of Capital	0.123	0.125
Debt-Equity ratio	1.6	—

(*i*) An investor owns 10% equity shares of company L. Show the arbitrage process and amount by which he could reduce his outlay through the use of leverage.

(*ii*) According to Modigliani and Miller, when will this arbitrage process come to an end ?

[B.Com. (H.) D.U., 2011]

Solution :

Arbitrage Process by Investor:

Sale of 10% Equity Shares in L Ltd.	₹ 31,250
+10% Loan (equal to 10% of ₹ 5,00,000)	50,000
Total Funds	81,250
Less: Purchase of 10% Equity of V Ltd.	80,000
Capital funds saved	1,250

Analysis of Income Position:

	L Ltd.	V Ltd.
Dividend	₹ 5,000	₹ 10,000
Less: Interest payable	-	5,000
Net income	5000	5,000

So, through arbitrage (sale of equity shares of L and buying Equity Shares of V), the investor can reduce his outlay by ₹ 1,250 and still getting same income of ₹ 5,000.

The arbitrage process will come to an end when the difference in value of L and V comes to zero.

Illustration 8.15

Two companies, X and Y belong to the equivalent risk group. The two companies are identical in every respect except that company Y is levered, while X is unlevered. The outstanding amount of debt of the levered company is ₹ 6,00,000 in 10% debenture. The other information for the two companies is as follows :

	X	Y
Net Operating Income (EBIT)	₹ 1,50,000	₹ 1,50,000
–Interest	–	60,000
Earnings to Equity holders	1,50,000	90,000
Equity capitalization rate, k_e	0.15	0.20
Market value of Equity	10,00,000	4,50,000
Market value of Debt	–	6,00,000
Total Value of Firm, V	10,00,000	10,50,000
Overall capitalization rate, k_o=EBIT/V	15.0%	14.3%
Debt Equity ratio	0	1.33

An investor owns 5% equity shares of company Y. Show the process and the amount by which he could reduce his outlay through use of the arbitrage process. Is there any limit to the 'process'? [*B.Com. (H.), D.U., 2012 Adapted*]

Solution :

Investor's current position (in firm Y) :

Dividend income (5% of ₹ 90,000)	₹ 4,500
Market value of investment (5% of ₹ 4,50,000)	22,500

He sells his holdings in firm Y for ₹ 22,500 and creates a personal leverage by borrowing ₹ 30,000 (5% of ₹ 6,00,000). The total amount with him is ₹ 52,500. He purchases 5% equity holdings of the firm X for ₹ 50,000 as the total value of the firm is ₹ 10,00,000. Further, his position with respect to income would be as follows :

	Company X	Company Y
Dividends (5% of profit)	₹ 7,500	₹ 4,500
–Interest (10% on ₹ 30,000)	3,000	—
Net Income	4,500	4,500

The investor, thus, can save an amount of ₹ 2,500 through the use of leverage and still continue to earn the same earnings of ₹ 4,500 as before. There are limits to the arbitrage process and it will come to an end when the market value of both the firms are same.

Illustration 8.16

Firms A and B are similar except that A is unlevered, while B has ₹ 2,00,000 of 5 per cent debentures outstanding. Assume that the tax rate is 30 per cent; NOI is ₹ 40,000 and the cost of equity is 10%. (*i*) Calculate the value of the firm, if the MM assumptions are met. (*ii*) If the value of the firm B is ₹ 3,60,000 then do these values represent equilibrium values. If not, how will equilibrium be set ? Explain.

Solution :

(*i*) **The value of the unlevered firm, A, is :**

$$V_A = \frac{EBIT(1-t)}{k_e} = \frac{40{,}000\,(1-.3)}{.10} = ₹\,2{,}80{,}000$$

The value of the levered firm, B, is :

$$V_B = V_A + Debt(t) = ₹\,2{,}80{,}000 + ₹\,2{,}00{,}000(.3)$$
$$= ₹\,3{,}40{,}000$$

(*ii*) The value of firm B is given as ₹ 3,60,000 whereas, it should be ₹ 3,40,000 (as above). Therefore, these do not represent the equilibrium values. Firm B is over valued by ₹ 20,000 (*i.e.*, ₹ 3,20,000 – 3,20,000). The arbitrage process with taxes, will work as follows to restore the equilibrium :

	Firm B
Value of Firm (given)	3,60,000
Value of Debt	2,00,000
Value of Equity	1,60,000
EBIT	40,000
–Interest	10,000
	30,000
–Taxes @ 30%	9,000
Net Profit	21,000

Assume an investor owns 10% of firm B's shares. His investment is :

$= .10 \times ₹\,1{,}60{,}000 = ₹\,16{,}000.$

and return is :

$= .10 \times ₹\,21{,}000 = ₹\,2{,}100.$

The investor can get the same income by shifting his investment to firm A . He would sell his holdings in B Co. for ₹ 16,000 and borrow on personal account ₹ 14,000 *i.e.*, (10% of ₹ 2,00,000) × (1–t), which is his percentage holding in B Co.'s debt. He would then, out of cash available, purchase 10% of firm A's shares for ₹ 28,000 (*i.e.*, 10% of ₹ 2,80,000). His return with respect to both the firms would be as follows :

	Firm A	Firm B
Dividends	₹ 2,800	₹ 2,100
–Interest (5% on ₹ 14,000)	700	—
Net Income	2,100	2,100

Through the arbitrage process and the substitution of personal leverage for corporate leverage, the investor can switch firm B to A, earn the same total return of ₹ 2,100, and have funds of ₹ 2,000 (*i.e.,* ₹ 16,000 + 14,000–28,000) left over to invest elsewhere. This process would continue till the equilibrium is restored.

Illustration 8.17

Two companies, L and U belong to the same risk class. The two firms are identical in every respect except that company L has 10% debentures. The valuation of the two firms as per the Traditional theory is as follows :

	L	U
Net Operating Income (EBIT)	₹ 22,50,000	₹ 22,50,000
Interest	1,50,000	- -
Earnings to Equity holders	21,00,000	22,50,000
Equity capitalization rate (k_e)	0.14	0.125
Market value of Equity	1,50,00,000	1,80,00,000
Market value of Debt	15,00,000	—
Total Value of Firm (V)	1,65,00,000	1,80,00,000
Overall capitalization rate, k_o	13.64%	12.50%
Debt Equity ratio	0.1	0

Show the arbitrage process by which an investor having shares worth ₹ 22,500 in company U will be benefited by switching over to company L.

Solution :

Investor having shares of worth ₹ 22,500 out of the total worth of equity of company U *i.e.,* ₹ 180 lacs, is holding .125% (*i.e.,* ₹ 22,500/₹ 180 lacs) shares of company U. His current income from company U is as follows :

Dividend Income = .125% of ₹ 22,50,000 *i.e.,* ₹ 2,812.50. His worth of investment is 22,500.

He now sells his holding in the company U for ₹ 22,500 and acquires .125% of equity of company L at a cost of ₹ 18,750 *i.e.,* .125% of ₹ 150 lacs. He also invests ₹ 1,875 *i.e.,* .125% of ₹ 1,50,000 in 10% debts. As a result of this investment, his income would be as follows :

Dividend Income = ₹ 2,625 *i.e.,* .125% of ₹ 21,00,000 together with an interest income of ₹ 187.50 (*i.e.,* 10% on debt investment of ₹ 1,875).

Thus, the investor will be able to maintain his income of ₹ 2,812.50 and also able to make a saving of ₹ 1,875 (*i.e.,* ₹ 22,500–₹ 18,750–₹ 1,875). The arbitrage process has therefore, helped the investor to maintain his income and simultaneously saving some funds.

Illustration 8.18

Gili Diamond Ltd. has the required rate of return of 12% on its assets. It can borrow in the market @ 8%. Assuming MM model (without taxes), what would be the cost of equity of the firm, if it has target capital structure of 80% equity or 50% equity?

Solution:

As per MM Proposition II, the cost of equity is:

$$k_e = k_o + (k_o - k_d)(D/E)$$

If equity is 80%:

$$k_e = .12 + (.12 - .08)\,(20/80) = .13 \text{ or } 13\%$$

If Equity is 50% :

$$k_e = .12 + (.12 - .08)\,(50/50) = .16 \text{ or } 16\%.$$

Illustration 8.19

Following information is available in respect of Lev Ltd. and Unlev Ltd.

	Lev. Ltd.	Unlev Ltd.
Profit before Interests and Tax	₹ 10,00,000	₹ 10,00,000
– Interest @ 8%	1,60,000	–
Profit before tax	8,40,000	10,00,000
– Tax @ 35%	2,94,000	3,50,000
Profit after tax	5,46,000	6,50,000

Show and verify that value of levered firm is equal to value of unlevered firm plus PV of tax shield on interests. Use MM Model (with taxes), given the k_e for Unlev Ltd. is 20%.

Solution :

In case of Unlev Ltd., the k_e is 20% and EBIT is ₹ 10,00,000. So, the value of equity or value of firm is :

$$V_U = \frac{₹\,6,50,000}{.20} = ₹\,32,50,000$$

Value of Lev Ltd. (as per question):

V_L = V_U + PV of Tax Shield on Debt Interest
= ₹ 32,50,000 + (₹ 1,60,000 × .35) ÷ .08)
= ₹ 32,50,000 + (₹ 56,000 ÷ .08)
= ₹ 39,50,000

As per MM Model, $V_L = V_U + D(t)$

Value of Debt of Lev. Ltd. is ₹ 20,00,000 (1,60,000 ÷ 8%)

D(t) = ₹ 20,00,000 × .35 = 7,00,000
V_L = ₹ 32,50,000 + 7,00,000 = ₹ 39,50,000
So, Value of Lev. Ltd. = Value of Unlev Ltd. + PV of Tax Shield
or, V_L = V_U + D(t)

OBJECTIVE TYPE QUESTIONS

State whether each of the following statements is ***True (T)*** *or* ***False (F)****.*

(*i*) The financing decision affects the total operating profits of the firm.

(*ii*) The equity shareholders get the residual profit of the firm.

(*iii*) There is no difference of opinion on the relationship between capital structure and value of the firm.

(*iv*) The ultimate conclusions of NI approach and the NOI approach are same.

(*v*) In NI approach, the k_e is assumed to be same and constant.

(*vi*) In NI approach, the k_o falls as the degree of leverage is increased.

(*vii*) In NOI approach, k_d and k_o are taken as constant.

(*viii*) The NOI approach says that there is no optimal capital structure.

(*ix*) The traditional approach says that a firm may attain an optimal capital structure.

(*x*) At optimal capital structure, the k_o of the firm is highest.

(*xi*) MM model provides a behavioural justification of NOI approach.

(*xii*) In MM model, personal leverage and corporate leverage are considered as perfect substitute.

(*xiii*) MM model is difficult to be applied in practice.

(*xiv*) In the basic MM model, leverage does not affect the value of the firm.

(*xv*) In the MM model, the value of the levered firm can be found by first finding out the value of the unlevered firm.

[**Answers :** *(i) F, (ii) T, (iii) F, (iv) F, (v) T, (vi) T, (vii) T, (viii) T, (ix) T, (x) F, (xi) T, (xii) T, (xiii) T, (xiv) T, (xv) T.*]

MULTIPLE CHOICE QUESTIONS

1. Which of the following is true for Net Income Approach?
   (*a*) Higher Equity is better,
   (*b*) Higher Debt is better,
   (*c*) Debt Ratio is irrelevant,
   (*d*) None of the above.

2. In case of Net Income Approach, the Cost of equity is :
   (*a*) Constant,
   (*b*) Increasing,
   (*c*) Decreasing,
   (*d*) None of the above.

3. In case of Net Income Approach, when the debt proportion is increased, the cost of debt :
   (*a*) Increases,
   (*b*) Decreases,
   (*c*) Constant,
   (*d*) None of the above.

4. Which of the following is true of Net Income Approach?
   (*a*) $V_F = V_E + V_D$,
   (*b*) $V_E = V_F + V_D$,
   (*c*) $V_D = V_F + V_E$,
   (*d*) $V_F = V_E - V_D$.

5. In Net Operating Income Approach, which one of the following is constant?
   (*a*) Cost of Equity,
   (*b*) Cost of Debt,
   (*c*) WACC & k_d,
   (*d*) k_e and k_d.

6. NOI Approach advocates that the degree of debt financing is :
   (*a*) Relevant,
   (*b*) May be relevant,
   (*c*) Irrelevant,
   (*d*) May be irrelevant.

7. 'Judicious use of leverage' is suggested by :
   (*a*) Net Income Approach,
   (*b*) Net Operating Income Approach,
   (*c*) Traditional Approach,
   (*d*) All of the above.

8. Which one is true for Net Operating Income Approach?
   (*a*) $V_D = V_F - V_E$,
   (*b*) $V_E = V_F + V_D$,
   (*c*) $V_E = V_F - V_D$,
   (*d*) $V_D = V_F + V_E$.

9. In the Traditional Approach, which one of the following remains constant?
   (*a*) Cost of Equity,
   (*b*) Cost of Debt,
   (*c*) WACC,
   (*d*) None of the above.

10. In MM Model, irrelevance of capital structure is based on :

(*a*) Cost of Debt and Equity,

(*b*) Arbitrage Process,

(*c*) Decreasing k_o,

(*d*) All of the above.

11. 'That there is no corporate tax' is assumed by :

(*a*) Net Income Approach,

(*b*) Net Operating Income Approach,

(*c*) Traditional Approach,

(*d*) All of these.

12. 'That personal leverage can replace corporate leverage' is assumed by :

(*a*) Traditional Approach,

(*b*) MM Model,

(*c*) Net Income Approach,

(*d*) Net Operating Income Approach.

13. Which of the following argues that the value of levered firm is higher than that of the unlevered firm?

(*a*) Net Income Approach,

(*b*) Net Operating Income Approach,

(*c*) MM Model with taxes,

(*d*) Both (*a*) and (*c*).

14. In Traditional Approach, which one is correct?

(*a*) k_e rises constantly,

(*b*) k_d decreases constantly,

(*c*) k_o decreases constantly,

(*d*) None of the above.

15. Which of the following assumes constant k_d and k_e ?

(*a*) Net Income Approach,

(*b*) Net Operating Income Approach,

(*c*) Traditional Approach,

(*d*) MM Model.

16. Which of the following is true?

(*a*) Under Traditional Approach, overall cost of capital remains same,

(*b*) Under NI Approach, overall cost of capital remains same,

(*c*) Under NOI Approach, overall cost of capital remains same,

(*d*) None of the above.

17. The Traditional Approach to Value of the firm assumes that :

(*a*) There is no optimal capital structure,

(*b*) Value can be increased by judicious use of leverage,

(*c*) Cost of Capital and Capital structure are independent,

(*d*) Risk of the firm is independent of capital structure.

18. A firm has EBIT of ₹ 50,000. Market value of debt is ₹ 80,000 and overall capitalization rate is 20%. Market value of firm under NOI Approach is :

(*a*) ₹ 2,50,000,

(*b*) ₹ 1,70,000,

(*c*) ₹ 30,000,

(*d*) ₹ 1,30,000.

19. Which of the following is incorrect for NOI ?

(*a*) k_0 is constant,

(*b*) k_d is constant,

(*c*) k_e is constant,

(*d*) k_d & k_0 are constant.

20. Which of the following is incorrect for value of the firm ?

(*a*) In the initial preposition, MM Model argues that value is independent of the financing mix.

(*b*) Total value of levered and unlevered firms be same otherwise arbitrage will take place.

(*c*) Total value incorporates borrowings by firm but excludes personal borrowing.

(*d*) Total value does not change because underlying risk does not change with financing mix.

21. Which of the following appearing in the balance sheet, generates tax advantage and hence affects the capital structure decision ?

(*a*) Reserves and Surplus,

(*b*) Long-term debt,

(*c*) Preference Share Capital,

(*d*) Equity Share Capital.

22. In MM Model with taxes, where 'r' is the interest rate, 'D' is the total debt and 't' is tax rate, then present value of tax-shields would be :

(*a*) $r \times D \times t$,

(*b*) $r \times D$,

(*c*) $D \times t$,

(*d*) $(D \times r)/(1 - t)$.

[**Answers :** *1(b), 2(a), 3(c), 4(a), 5(c), 6(c), 7(c), 8(c), 9(d), 10(b), 11(d), 12(b), 13(d), 14(d), 15(a), 16(c), 17(b), 18(b), 19(c), 20(d), 21(b), 22(e)*].

ASSIGNMENTS

1. Write short notes on :
   (*a*) Home made leverage.
   (*b*) Optimal capital structure.
   (*c*) Concept of value of the firm.
2. Explain the Traditional theory of cost of capital and capital structure. *[B. Com.(H.), D.U., 2009]*
3. What are the assumptions and implications of NI approach? Is there an optimal capital structure as per NI approach?
4. What are the assumptions and implications of NOI approach? Is there an optimal capital structure as per NOI approach?
5. Under the Traditional approach to capital structure, what happens to the cost of debt and cost of equity when leverage increases? Describe the behaviour of overall cost of capital.
6. Critically evaluate the NI and NOI approach to capital structure.
7. What is the effect of corporate tax on the value of the firm? How the MM approach incorporates the corporate taxes in the valuation model?
8. How the cost of equity capital behaves in the Traditional theory and MM approach on capital structure? *[B. Com. (H.), D.U., 2014]*
9. Explain with suitable example the arbitrage process of MM approach to achieve the equilibrium level.
10. Explain the Net Operating Income approach to Capital Structure. *[B. Com. (H.), D.U., 2013]*
11. Modigliani and Miller argue that in the absence of taxes, a firm's market value and the cost of capital remain invariant to the changes in the capital structure. What behavioural justification they give in their hypothesis ?
12. Comment upon the utility of Net Income Approach of capital structure in real world. *[B. Com. (H.), D.U., 2013]*
13. The MM hypothesis realistic with respect to capital structure and value of the firm in actual practice ? If not, what are its main weaknesses ? *[B. Com. (H.), D.U. 2009]*
14. Enumerate the assumptions of NI Approach. Is there an optimal capital structure as per NI? *[B. Com. (H.), D.U. 2010]*
15. Enumerate the main assumptions of the Traditional Approach to Capital Structure. *[B. Com. (H.), D.U., 2011]*

PROBLEMS

P8.1 XYZ Manufacturing Co., has a total capitalisation of ₹ 10,00,000 and normally earns ₹ 1,00,000 (before interest and taxes). The financial manager of the firm wants to take a decision regarding the capital structure. After a study of the capital market, he gathers the following data:

Amount of Debt	Interest Rate	k_e%
0	–	10.00
1,00,000	4.0	10.50
2,00,000	4.0	11.00
3,00,000	4.5	11.60
4,00,000	5.0	12.40
5,00,000	5.5	13.50
6,00,000	6.0	16.00
7,00,000	8.0	20.00

(*a*) What amount of debt should be employed by the firm if the traditional approach is held valid?

(*b*) If the Modigliani-Miller approach is followed, what should be the equity capitalisation rate?

Assume that corporate taxes do not exist, and that the firm always maintains its capital structure at book values.

[*Answer :* (*a*) Debt of ₹ 4,00,000 is best having k_o = 9.44%, (*b*) k_e at debt of ₹ 4,00,000 will be 13.33%.]

P8.2 X Ltd. and Y Ltd. are identical except that the former uses debt while the latter does not. The levered firm has issued 10% Debentures of ₹ 9,00,000. Both the firms earn EBIT of 20% on total assets of ₹ 15,00,000. Assuming tax rate of 50% and capitalization rate of 15% for an all-equity firm :

(*i*) Compute the value of the two firms using NOI approach.

(*ii*) Calculate the overall cost of capital, k_o, for both the firms using NOI approach.

[*Answer:* (*i*) ₹ 14,50,000 and ₹ 10,00,000, (*ii*) 10.34% and 15% respectively.]

P8.3 A Company's current operating income is ₹ 4 lakhs. The firm has ₹ 10 lakhs of 10% debt outstanding. Its cost of equity capital is estimated to be 15%.

(*i*) Determine the current value of the firm, using traditional valuation approach.

(*ii*) Calculate the firm's overall capitalisation rate.

(*iii*) The firm is considering to increase its leverage by raising an additional ₹ 5,00,000 debt and using the proceeds to retire that amount of equity. As a result of increased financial risk, the rate of interest is likely to go up to 12% and k_e to 18%. Would you recommend the plan?

[*Answer:* Total value of the firm is ₹ 30,00,000. The overall capitalization rate is 13.33%. New plan may not

be recommended as the value is expected to go down to ₹ 27,22,222.]

P8.4 Companies U and L are identical in every respect, except that U is unlevered while L is levered. Company L has ₹ 20,00,000 of 8% Debentures outstanding. Assume (1) that all the MM assumptions are met, (2) that the tax rate is 50%, (3) that EBIT is ₹ 6,00,000 and that equity-capitalisation rate for company U is 10%.

(*a*) What would be the value for each firm according to MM's approach?

(*b*) Suppose V_U = ₹ 25,00,000 and VL = 45,00,000. According to MM, do they represent equilibrium values? If not, explain the process by which equilibrium will be restored.

[*Answer :* Values are ₹ 30,00,000 and ₹ 40,00,000.]

P8.5 The Levered Company and the Unlevered Company are identical in every respect except that the Levered Company has 6% ₹ 2,00,000 debt outstanding. As per the NI approach, the valuation of the two firms is as follows:

	Unlevered Co.	**Levered Co.**
Net Operating Income, EBIT	₹ 60,000	₹ 60,000
Total cost of Debt	0	12,000
Net Earnings, NI	60,000	48,000
Equity capitalisation rate, k_e	.100	.111
Market value of Shares, E	6,00,000	4,32,000
Market value of Debt, D	0	2,00,000
Total value of the Firm, V	6,00,000	632,000

Mr. X holds ₹ 2,000 worth of Levered Company's shares. Is it possible for Mr. X to reduce his outlay to earn same return through the use of arbitrage? Illustrate.

[*Answer :* Yes, he will be able to maintain his return and save some capital funds also.]

P8.6 The values for two firms X and Y in accordance with the traditional theory are given below:

	X	**Y**
Expected Operating Income	₹ 50,000	₹ 50,000
Total cost of Debt	0	10,000
Net Income	50,000	40,000
Cost of Equity	0.10	0.11
Market value of Shares	5,00,000	3,60,000
Market value of Debt	0	2,00,000
Total value of Firm	5,00,000	5,60,000
Average Cost of Capital	0.10	0.09
Debt equity ratio	0	0.556

Compute the values for firms X and Y as per the MM approach, Assume that (*i*) corporate income taxes do not exist, and (*ii*) the equilibrium value of k_0 is 12.5%.

[*Answer :* Values of the firm are ₹ 4,00,000 and k_e are 12.5% and 20% respectively.]

P8.7 The following are the costs and values for the firms A and B according to the traditional approach:

	Firm A	**Firm B**
Total value of Firm, V	50,000	60,000
Market value of Debt, D	0	30,000
Market value of Equity, E	50,000	30,000
Expected Net Operating Income	5,000	5,000
–Cost of Debt	0	1,800
Net Income	5,000	3,200
Cost of Equity, k_e = NI/E	10.00%	10.70%

Compute the equilibrium value for firms A and B in accordance with the MM approach. Assume that (*i*) taxes do not exist and (*ii*) the equilibrium value of k_o is 9.09%.

[*Answer:* Equilibrium value is ₹ 55,000 and k_e for the two firms would be 9.09% and 12.8%.]

CHAPTER

9

Capital Structure : Planning and Designing

"In practice, how does the financial manager determine the optimal capital structure for the particular firm ? Our concern is with ways of coming to grips with the formidable problem of determining and appropriate capital structure. In this regard, various methods of analysis are available. None of the methods considered is completely satisfactory in itself. Taken collectively, however, they provide the financial manager with sufficient information for making a rational decision. One should hold no illusions that the financial manager will be able to identify the precise percentage of debt that will maximize share price. Rather he should try to determine the approximate proportion of debt to employ in keeping with the objective of maximizing share price."[1]

SYNOPSIS

- The Background.
- Factors Determining Capital Structure.
  - Minimization of Risk.
  - Control.
  - Flexibility.
  - Profitability.
- Profitability and Capital Structure.
  - EBIT-EPS Analysis.
- Liquidity and Capital Structure.
  - Cash Flow Analysis.
- Financial Distress.
- Other Considerations.
- Graded Illustrations in Capital Structure.

1. Van Home James C., *Financial Management and Policy,* Prentice-Hall of India, New Delhi, India Reprint p. 228.

In the previous chapter, various theories of capital structure have been discussed in an attempt to establish the relationship between leverage, cost of capital and value of the firm. The different theories have given differing explanations. Theoretically speaking, a judicious use of debt and equity in capital structure can maximize the value of the firm. But, how this ideal debt equity mix be determined? There is no doubt the benefits available by the use of debt in the capital structure. The main benefit of debt financing is its interest tax-deductibility which results in relatively higher profits for the shareholders. Does it mean that a firm should go on increasing the debt proportion in its capital structure? If every increase in debt financing is going to increase the earnings for the shareholders, then every firm would have been 99.99% debt financed (because 100% debt financing is simply not possible).

So, between the two extremes of 0% debt financing and 99.99% debt financing, a particular debt-equity mix is to be decided. There is no mathematical technique or method available to determine the optimal debt-equity mix and identifying the optimal capital structure is a formidable task, if not impossible. Any attempt to design a capital structure therefore, be undertaken in the light of two propositions :

1. That the capital structure be designed in such a way so as to lead to the objective of maximization of shareholders wealth, and
2. The exact optimal capital structure may be impossible and therefore, efforts be made to achieve the best approximation to the optimal capital structure.

FACTORS DETERMINING CAPITAL STRUCTURE

A nearly endless list of factors relative to capital structure decisions could be created, however, some of the more important of these factors are discussed here. The considerations affecting the capital structure decisions can be studied in the light of the following :

1. **Minimization of Risk :** A firm's capital structure must be developed with an eye towards risk because it has a direct link with the value. Risk may be factored for two considerations : (*a*) the capital structure must be consistent with the business risk, and (*b*) the capital structure results in a certain level of financial risk.

   Business risk may be defined as the relationship between the firm's sales and its earnings before interest and taxes (EBIT). In general, the greater the firm's operating leverage - the use of fixed operating cost- the higher its business risk.

   The firm's capital structure directly affects its financial risk, which may be described as the risk resulting from the use of financial leverage. Financial leverage is concerned with the relationship between earnings before interest and taxes (EBIT) and earnings per share (EPS). The more fixed-cost financing *i.e.,* debt (including financial leases) and preferred stock, a firm has in capital structure, the greater its financial risk. Since the level of this risk and the associated level of return are key inputs to the valuation process, the firm must estimate the potential impact of alternative capital structures on these factors and ultimately on value in order to select the best capital structure.

   A capital structure may be called an efficient capital structure if it keeps the total risk of the firm to the minimum level. The long term solvency and financial risk of a firm should be assessed for a given capital structure. Since, increase in debt financing affects the solvency as well as the financial risk of the firm, the excessive use of debt financing should be avoided. It may be noted that the balancing of both the financial and business risk is implied so that the total risk of the firm is kept within desirable limits. A firm having higher business risk should keep the financial risk to the minimum level, otherwise the firm will become a high risk proposition resulting in higher cost of capital.

2. **Control :** The ultimate decision making power of the firm lies in the hands of equity shareholders, therefore, the issue of additional shares can affects who controls the firm. A management concerned about control may prefer to issue debt rather than equity shares to raise funds. A capital structure of a firm should be one which reflects the management's philosophy of control over the firm. Redeemable debenture, even if excessive, will not result in dilutions of control but convertible debentures will result in dilution of control when the debenture will be converted into equity share. Similarly, the Cumulative Convertible Preference Shares and Convertible Loans from financial institutions will result in dilution of control. 50% of total paid up capital gives, practically, absolute control to the promoter-management of the firm.

   The existence of preference share capital and debt financing, as such do not dilute the controlling powers of the management. It may be noted that the preference shareholders are entitled to participate in decision making through voting on a resolution in certain cases only. Section 87 of the Companies Act, 1956 provides that cumulative preference shareholders have a right to vote on all resolutions if their dividends have remained unpaid for an aggregate period of not less than two years preceding the date of meeting. In case of non-cumulative preference shares, the shareholders have a right to vote on all resolutions if their dividends are unpaid for two financial years immediately preceding the date of meeting or for any three years during a period of 6 years ending with the financial year preceding the meeting. On the other hand, the debt investors cannot take direct part in the managerial decision making, however, in case of a long term loan from financial institutions, a condition is generally imposed under which a representative of the lending financial institutions is placed on the Board of Directors of the firm.

3. **Flexibility :** The flexibility of a capital structure refers to ability of the firm to raise additional capital funds whenever needed to finance profitable and viable investment opportunities. The capital structure should be one which enables the firm to meet the requirements of the changing

situations. More precisely, flexibility means that a capital structure should always have an untapped borrowing powers which can be used in conditions which may arise any time in future due to uncertainty of Capital market, Government policies etc. If the capital market conditions are conducive to the issue of capital, then the preference may be given to issue of capital, rather than issue of debt. Further, if there is still untapped borrowing capacity, then debt instruments may be issued, subject to conditions prevailing in the capital market.

4. **Profitability :** A capital structure should be the most profitable from the point of view of equity shareholders. Therefore, within the given constraints, maximum debt financing (which is generally cheaper) should be opted to increase the returns available to the equity shareholders. Implications of different alternative capital structure on the EPS of the firm have already been analyzed in Chapter 14. In addition, an analysis of rate of return on total assets and the cost of debt may be made. If the rate of return on total assets is more than the cost of debt then the financial leverage may enhance the returns for the equity shareholders.

Capital Structure of a New Firm : The capital structure of a new firm is designed in the initial stages of the firm and the financial manager has to take care of many considerations. He is required to assess and evaluate not only the present requirement of capital funds but also the future requirements. The present capital structure should be designed in the light of a future target capital structure. Future expansion plans, growth and diversifications strategies should be considered and factored in the analysis.

Capital Structure of an Existing Firm : An existing firm may require additional capital funds for meeting the requirements of growth, expansion, diversification or even sometimes for working capital requirements. Every time the additional funds are required, the firm has to evaluate various available sources of funds *vis-a-vis* the existing capital structure. The decision for a particular source of funds is to be taken in the totality of capital structure *i.e.,* in the light of the resultant capital structure after the proposed issue of capital or debt.

Evaluation of Proposed Capital Structure : A financial manager has to critically evaluate various costs and benefits, implications and the after-effects of a capital structure before deciding the capital mix. Moreover, the prevailing market conditions are also to be analyzed. For example, the present capital structure may provide a scope for debt financing but either the capital market conditions may not be conducive or the investors may not be willing to take up the debt-instrument. Thus, a capital structure before being finally decided must be considered in the light of the firms internal factors as well as the investor's perceptions.

Broadly speaking, there are two basic analyses required for the valuation of a proposed capital structure. One from the point of view of the profitability and the other from the point of view of liquidity. These two analyses have been taken up in the following discussion.

PROFITABILITY AND CAPITAL STRUCTURE : EBIT-EPS ANALYSIS

The relationship between EBIT, financial leverage and EPS has already been discussed at length in Chapter 8. The financial leverage affects the pattern of distribution of operating profit among various types of investors and increases the variability of the EPS of the firm. Therefore, in search for an appropriate capital structure for a firm, the financial manager must, *inter alia,* analyze the effects of various alternative financial leverages on the EPS. For this, he must understand as to how sensitive is the EPS to a change in EBIT under different financial plans.

Given a level of EBIT, EPS will be different under different financing mix depending upon the extent of debt financing. The effect of leverage on the EPS emerges because of the existence of fixed financial charge *i.e.,* interest on debt financing or fixed dividend on preference share capital. It has already been discussed that this fixed financial charge can be used to magnify the returns available to the equity shareholders *i.e.,* to magnify the EPS and consequently the market price of the share.

The effect of fixed financial charge on the EPS depends upon the relationship between the rate of return on assets and the rate of fixed charge. If the rate of return on assets is higher than the cost of financing, then the increasing use of fixed charge financing (*i.e.,* debt and preference share capital) will result in increase in the EPS. This situation is also known as **favourable financial leverage** *or* **Trading on Equity**. On the other hand, if the rate of return on assets is less than the cost of financing, then the effect may be negative and therefore, the increasing use of debt and preference share capital may reduce the EPS of the firm.

The fixed financial charge financing may further be analyzed with reference to the choice between the debt financing and the issue of preference shares. Theoretically, the choice is tilted in favour of debt financing because of two reasons : (*i*) the explicit cost of debt financing *i.e.,* the rate of interest payable on debt instruments or loans is generally lower than the rate of fixed dividend payable on preference shares, and (*ii*) interest on debt financing is tax-deductible and therefore the real costs (after-tax) is lower than the cost of preference share capital.

Thus, the analysis of the different capital structure and the effect of leverage on the expected EPS will provide a useful guide to select a particular level of debt financing. The EBIT-EPS analysis is of significant importance and if undertaken properly, can be an effective tool in the hands of a financial manager to get an insight into the planning and designing the capital structure of the firm.

Limitations of EBIT-EPS Analysis : If maximization of the EPS is the only criterion for selecting the particular debt-equity mix, then that capital structure which is expected to result in the highest EPS will always be selected by all the firms. However, achieving the highest EPS need not be the only goal of the firm. The main shortcomings of the EBIT-EPS analysis may be noted as follows :

(*i*) **The EPS criterion ignore the risk dimension :** The EBIT-EPS analysis ignores as to what is the effect of leverage on the overall risk of the firm. With every increase in financial leverage, the risk of the firm and therefore that of investors also increase. The EBIT-EPS analysis fails to deal with the variability of EPS and the risk return trade-off.

(*ii*) **EPS is more of a performance measure :** The EPS basically, depends upon the operating profit which in turn, depends upon the operating efficiency of the firm. It is a resultant figure and it is more a measure of performance rather than a measure of decision making.

These shortcomings of the EBIT-EPS analysis do not, in any way, affect its value in capital structure decisions. Rather, the following dimensions may be added to the EBIT-EPS analysis to make it more meaningful.

(*a*) **The Risk Considerations :** The risk attached with the leverage may be incorporated in the EBIT-EPS analysis. The financial manager may start by finding out the indifference level of EBIT (*i.e.*, the level of EBIT at which the EPS will be same for more than one capital structure). The expected value of EBIT may then be compared with this indifference level of EBIT. If the expected value of EBIT is more than the indifference level of EBIT, than the debt financing is advantageous to the firm. The more is the difference between the expected EBIT and the indifference level of EBIT, greater is the benefit of debt financing, and so stronger is the case for debt financing.

In case, the expected EBIT is less than the indifference level of EBIT, then the probability of such occurrence is to be assessed. If the probability is high, *i.e.*, there are more chances that the expected EBIT may fall below the indifference level of EBIT, then the debt financing is considered to be risky. If, however, the probability is negligible, then the debt financing may be opted.

(*b*) **Debt Capacity :** Whenever a firm goes for debt financing (howsoever big or small), it inherently opts for taking two burdens, *i.e.*, the burden of interest payment and the burden of repayment of the principal amount. Both these burdens are to be analyzed (*i*) from the point of view of liquidity required to meet the obligations, and (*ii*) from the point of view of debt capacity. The liquidity aspects of debt financing is discussed in the next section of this chapter.

The profits of the firms *vis-a-vis* the burden of debt financing should also be analyzed. The debt capacity or ability of the firm to service the debt can be analyzed in terms of the coverage ratio, which shows the relationship between the EBIT and the fixed financial charge. The higher the EBIT in relation to fixed financial charge, the better it is. For this purpose, *Interest coverage ratio* may be calculated as follows:

$$\text{Interest Coverage Ratio} = \text{EBIT}/\text{Fixed Interest Charge.}$$

The coefficient given by this ratio shows the number of times the EBIT is for a given interest. The higher the coefficient, the greater is the certainty that the firm would be in a position to meet the obligations of interest payment. Together with the EBIT-EPS analysis for different levels of debt financing, the interest coverage ratio may also be calculated for different levels of financial leverages.

LIQUIDITY AND CAPITAL STRUCTURE : CASH FLOW ANALYSIS

In the previous section on debt capacity, it has been mentioned that the debt financing entails burden of interest payment and repayment of principal. The interest coverage ratio considers only the extent of interest being covered by the EBIT. This need not necessarily ensure the availability of liquid resources to pay the interest or the principal repayment.

A company (although earning sufficient profits) may not be generating large enough cash surplus, perhaps due to the needs to re-invest heavily in working capital. Such a firm will find it difficult to service the fixed interest and the preference dividend. If it is so, then the firm may resort to equity financing where dividend tends to be lower and can be reduced or skipped if the cash is scarce. Companies which can generate large cash surplus from their operations will tend to opt for larger debt financing.

A finance manager, while evaluating different capital structure, should also find out the liquidity required for (*i*) interest on debt, (*ii*) repayment of debt, (*iii*) dividend on preference share capital, and (*iv*) redemption of preference share capital. It may be noted that in India, a company can issue only redeemable preference share capital (section 80 of the Companies Act, 1956). Therefore, the cash required for redemption of preference share capital must also be considered however, the dividends on preference shares are payable only if the profits are there. So, the interest on debenture requires a compulsory cash outflow whereas, the preference dividends require only conditional cash outflow. The requirement of liquidity should then be compared with the cash availability from operations of the firm as follows :

1. **Debt Service Coverage Ratio :** In the Debt Service Coverage Ratio (DSCR), the cash profits generated by the operations are compared with the total cash required for the service of the debt and the preference share capital *i.e.*,

$$\text{DSCR} = \frac{\text{PAT} + \text{Depreciation} + \text{Interest} + \text{Non-cash expenses}}{\text{Pref. Dividend} + \text{Interest} + \text{Repayment Obligation}}$$

In the above equation, Pref. Dividend may be taken as inclusive of the Corporate Dividend Tax. The DSCR helps in assessing the extent to which cash profits of the firm covers the cash obligations for revenue nature payments as well as the capital nature payments. The higher the DSCR, the better it is and the firm will face no financial difficulty in meeting its obligations.

2. **Projected Cash flow Analysis :** The firm may also undertake the cash flow analysis for the period under consideration. This will enable the financial manager to assess the liquidity capacity of the firm to meet the obligations of interest payments and the repayment of principal obligations. A projected cash budget may be prepared to

find out the expected cash inflows and cash outflows (including interest and repayments). If the inflows are comfortably higher than the outflow, then the firm can proceed with the debt financing. A firm may have three types of cash flows : (*i*) those relating to operations of the firm, (*ii*) cash flows relating to capital nature transactions, and (*iii*) financial flows relating to interest, dividend and repayments etc. In the projected cash flow analysis, all these cash flows are to be considered.

The cash flow analysis may be extended by incorporating the risk of cash insolvency associated with different levels of debt financing. Every firm should decide the limits of risk, which it will like to take in respect of cash outflow obligations. Cash inflow positions in different operating conditions should be assessed by incorporating the probabilities of demand etc. The difference between the expected cash flows under different operating conditions and the cash outflows including those required for debt and preference capital servicing, should be identified. If the differences are within specified limits, the firm may proceed with the proposed capital structure.

EBIT-EPS Analysis *versus* Cash flow Analysis (*i.e.*, Profitability *versus* Liquidity) : In the EBIT-EPS analysis, it has been pointed out that a financial manager should evaluate a capital structure from the point of view of the profitability of equity shareholders. A capital structure which is expected to result in maximization of EPS should be selected. Financial leverages at different levels are considered so as to find out their effect on the EPS.

On the other hand, in the cash flow analysis, the liquidity side of the leverage is stressed. A capital structure should be evaluated in the light of available liquidity. The firm need not face any liquidity problem in debt servicing.

Under these two analyses, the different aspects of the capital structure are evaluated. The EBIT-EPS analysis stresses the profitability of the proposed financing mix and analyses it from the point of view of equity shareholders. The cash flow analysis looks upon a financing mix and stresses the need for liquidity requirement of debt financing and thus, it emphasizes the debt investor.

Does it mean that these two analysis are mutually exclusive ? No, these two are not mutually exclusive, rather these are complementary and provide an insight into the capital structure from different point of view. No firm can afford to overlook the interest of either the shareholder or the debt investors. The two analyses should be taken simultaneously and a proposed capital structure before being adopted and implemented must be analyzed extensively. A capital structure must take care of the interest of equity shareholders as well as the debt investors.

FINANCIAL DISTRESS : In general, the value of the firm continues to rise with leverage and therefore, a firm should use as much debt as possible but debt financing has its own costs and implications also. Since EBIT is uncertain, there is always a possibility that it may drop too low to permit the firm to meet its contractual obligations. An increase in debt thus increases the probability of *financial distress*. The financial distress is a situation when a firm finds it difficult to honour its commitment to the creditors/debt investors. With reference to capital structure, the financial distress refers to the situation when the firm faces difficulties in paying interest and principal repayments to the debt investors. Financial distress arises when the fixed financial obligations of the firm affect the firm's normal operations. For example, if a firm has to dispose off some of its assets to meet the interest obligations, the firm is said to be in financial distress. The cash flow analysis must have taken care of all such possibilities, still a severe cash crunch may appear at any stage. In such a situation, the financial obligation of the firm may even require the firm to change its operational policies.

There are many degrees of financial distress. One extreme degree of financial distress is the bankruptcy, a condition in which the firm is unable to meet its financial obligation and faces liquidation.

It is easy to see how increased proportions of debt financing affect and give rise to financial distress. If a firm borrows more, than it will have to pay more to the debt investors in the form of interest. This increased interest bill increases the probability of default and hence results in financial distress. The cost of financial distress increases as the financial leverage increase. The higher the amount of financial leverage, the larger will be committed payments for the debt investors and the greater is the chance that the EBIT will not be sufficient to cover the payments to debt investors. For the shareholders also, higher financial leverage increases the chance that the firm may not be able to pay dividend.

However, still the debt financing is used almost unexceptionally because it brings benefits in the form of tax-shield. As a result, the firm should try to achieve a trade-off between the costs and benefits of debt financing. The cost being the financial distress and the benefits being the interest tax-shield. The financial manager must weigh the benefits of tax savings against the cost of financial distress in the form of increasing risk. The cost of financial distress is reflected in the market value of the firm and can be measured therefore, through its effect on the value of the firm. Lower levels of leverage will have little effects, but as the financial leverage increases, the cost of financial distress increases and the market value of the debt as well as the equity falls.

Other Considerations :

1. **Legal Framework :** At the time of evaluation of different proposed capital structure, the financial manager should also take into account the legal and regulatory framework. Long term loans from financial institutions and loans from commercial banks are available only on the security of assets. However, debentures can be issued either as secured debentures or unsecured debenture. In case the redemption period of debenture is more than 18 months, then credit rating is required as per SEBI guidelines. Moreover, SEBI guidelines are to be adhered to for raising funds from capital market whereas no such requirement if the firm avails loans from financial institutions. All these and other regulatory provisions must be taken into account at the time of deciding and selecting a capital structure for the firm.

2. **Agency Cost :** The equity investors and lenders do not always agree on the best course of action to protect their claims against the firm. Largely because, they have very different cash flow claims against the firm. Equity investors, who have a residual claim on the profits, tend to favour those actions that increase the value of their holding even if that means increasing the risk that the bondholders (who have a fixed claim on the profits) will not receive their promised payments. Bondholders, on the other hand, want to preserve and increase the security of their claims. Because the equity investors control the firm's management and the decision making, their interest will dominate the interest of the bondholders, unless the bondholders take some protective action.

So, the debt investors generally impose conditions in the loan agreements. These conditions may be : (*i*) Representative Director on the Board of Directors, (*ii*) Debenture Trustees, (*iii*) Maintaining a minimum current ratio, (*iv*) intensive internal controls, (*v*) regular follow up and reporting, etc. All these entail considerable costs as well as may impair the operating efficiency of the firm. There is always a cost, though non-monetary, of letting some outsider in. This agency cost is a function of leverage. For lower degree of leverage, this cost may be *nil* or negligible, but as the level of financial leverage increases, the debt investors may emphasize extensive monitoring and have considerable costs. The agency cost can appear in two ways as real costs :

1. If the debt investors believe that there is significant chance that the shareholder's actions might make them worse off, they can build this expectation into the bond prices by demanding a higher rate of interest.
2. If debt investors can protect themselves against such actions by writing in restrictive conditions, two costs may follow :
   (*a*) the direct cost of monitoring the conditions which increases as the conditions become more detailed and restrictive, and
   (*b*) the indirect cost of lost flexibility, because the firm is not able to take certain projects. This costs will also increase the conditions become more restrictive.

Conclusion : In designing the capital structure for any firm, the first major policy decision facing the firm is that of determining the appropriate level of debt. For most of the firms, the decision involves a choice between the long term debt and the equity. The firm's debt capacity may be best defined not as the maximum amount which the lenders or debt investors are willing to lend to the firm, but as the amount of debt that the firm should use.

The choice of an appropriate financing mix involves basically a trade-off between tax benefits and the costs of financial distress. The optimal debt level depends to an important extent on the operating risk of the firm. The greater the operating risk the less should be the degree of financial leverage. Alternative financial plans therefore, should be analyzed by the firm along with several dimensions. EBIT-EPS analysis is useful for evaluating the sensitivity of the EPS to a change in EBIT under alternative financing plans.

No such standard form of capital structure can be prescribed, which takes care of all types of firms and situations. The financing mix for a particular firm must be tailored made to suit the requirements, situations and the position of the firm. The operating efficiency of the firm, the capital market conditions, the expectations of different types of investors, the liquidity position of the firm, and last but not the least, the legal and regulatory framework and the constraints etc. should all be factored in the evaluation of proposed capital structure.

POINTS TO REMEMBER

- In practice, there may be a lot of factors and considerations that affect the planning and designing of the capital structure for a firm.
- Exact optimal capital structure may be impossible and therefore efforts should be made to achieve the best appromixation to the optimal capital structure.
- A capital structure for a firm should be planned :
  (*a*) to keep the financial risk of the firm to a minimum level,
  (*b*) to reflect the philosophy of the management regarding control over the firm,
  (*c*) To provide flexibility in the ability of the firm to raise additional capital funds whenever needed, and
  (*d*) to maximize the EPS of the equity shareholders.
- Two basic techniques available to study the impact of a particular capital structure are (*i*) EBIT-EPS Analysis, which studies the impact of financial leverage on the EPS of the firm and (*ii*) Cash flow Analysis, which emphasizes the liquidity required in view of a particular capital structure.
- Different accounting ratios such as Interest Coverage Ratio and Debt Service Coverage Ratio may be ascertained to find out the debt capacity of the firm and the cash profit generated by the firm which may be used to service the debt.
- In addition to the EBIT-EPS Analysis and the Cash Flow Analysis, a financial manager should also consider the
  (*i*) Legal framework, SEBI guidelines and the conditions applied by financial institutions, and
  (*ii*) The Agency Cost of the debt holders in the form of their representative on the Board of Directors *etc.*
- The financial manager should also take care of the financial distress which refers to the situation when the firm is not able to meet its interest/repayment liabilities and may even face a closure.

GRADED ILLUSTRATIONS

Illustration 9.1

Following is the income statement of Aakash Ltd. :

	(₹ in Crores)
Sales	500
Cost of goods sold (includes depreciation)	250
Selling and administrative expenses	50
EBIT	200
Taxes @ 35%	70
Net income	130

The company's cost of capital is 11% and its net assets are worth ₹ 800 crores.

(*i*) What is the conventional return on investment ?

(*ii*) What is net addition to the wealth of shareholders in the current year in terms of Economic Value Added ?

Solution

$$\text{Conventional Return on Investment} = \frac{\text{Net Income}}{\text{Net Assets}} = \frac{130}{800} = 16.25\%$$

Economic Value Added = Net Income – Cost of Capital Employed

= ₹ 130–(800 × .11) crores

= ₹ 130–88 crores

= ₹ 42 crores.

Illustration 9.2

The Calgary Company is attempting to establish a current assets policy. Fixed assets are ₹ 6 lakhs and the firm plans to maintain a 50% debt-to-assets ratio. The interest rate is 10% on all debts. Three alternative current assets policies are under consideration : 40%, 50% and 60% of projected sales. The company expects to earn 15% before interest and taxes on sales of ₹ 30 lakhs. Calgary's effective tax rate is 30% . What is the expected return on equity under each alternative ?

Solution :

The Expected Return on Equity under different alternatives may be ascertained as follows:

	40% CA	**50% CA**	**60% CA**
Sales	₹ 30,00,000	₹ 30,00,000	₹ 30,00,000
Fixed Assets	₹ 6,00,000	₹ 6,00,000	₹ 6,00,000
Current Assets	12,00,000	15,00,000	18,00,000
Total Assets	18,00,000	21,00,000	24,00,000
Debt to Assets Ratio	50%	50%	50%
So, Debt	9,00,000	10,50,000	12,00,000
Interest @ 10%	90,000	1,05,000	1,20,000
EBIT @ 15% of sales	4,50,000	4,50,000	4,50,000
– Interest	90,000	1,05,000	1,20,000
PBT	3,60,000	3,45,000	3,30,000
–Tax @ 30%	1,08,000	1,03,500	99,000
	2,52,000	2,41,500	2,31,000

Illustration 9.3

Alpha Company is contemplating conversion of 500 14% convertible bonds of ₹ 1,000 each. Market price of the bond is ₹ 1,080. Bond indenture provides that one bond will be exchanged for 10 shares. Price earning ratio before redemption is 20:1 and anticipated price-earning ratio after redemption is 25:1. Number of shares outstanding prior to redemption are 10,000. EBIT amounts to ₹ 2,00,000. The company is in the 35% tax bracket. Should the company convert bonds into shares ? Give reasons.

Solution :

	Present Position	**After Conversion**
EBIT	₹ 2,00,000	₹ 2,00,000
–Interest @ 14%	70,000	—
	1,30,000	2,00,000
– Tax @ 35%	45,500	70,000
	84,500	1,30,000
Number of Share	10,000	15,000
EPS	₹ 8.45	₹ 8.67
PE Ratio (given)	20	25
Expected Market Price	₹ 169.00	₹ 216.75

The company may opt for conversion of bonds into equity shares as this will result in increase in market price of the share from ₹ 169 of ₹ 216.75.

Illustration 9.4

XYZ Ltd. had issued convertible debentures with interest rate of 12%. Every debenture has an option to convert to 20 equity shares now or at the date of maturity. Debentures will be redeemed at ₹ 100 on maturity which is after 5 years. An investor normally requires a rate of return of 8% p.a. on a five years security. As an investor, would you exercise conversion at present if the market price of equity shares is (*i*) ₹ 4, (*ii*) ₹ 5, (*iii*) ₹ 6 ?

Solution :

The decision regarding conversion of debentures now or at the time of maturity, can be taken up comparing the value of holding at two points of time.

Value of debenture if debentures are not converted now :

PV of interest of ₹ 12 for 5 years @ 8% (12 × 3.993)	₹ 47.916
PV of Redemption value (₹ 100 × .681)	₹ 68.100
Total value	₹ 116.016

Value of Equity Shares if debenture is converted now :

Market Price			**Total**
₹ 4	(4 × 20)	=	₹ 80
₹ 5	(5 × 20)	=	₹ 100
₹ 6	(6 × 20)	=	₹ 120

So, the debentures conversion should be opted if the market price of the share is ₹ 6. Otherwise, the investor should wait for 5 years for debenture redemption.

Illustration 9.5

Gentry Motors Ltd., a producer of turbine generators, is in this situation : EBIT = ₹ 40 lakhs; Tax rate = t = 35%, Debt outstanding = D = ₹ 20 lakhs; Rate of Interest = 10%, k_e = 15%; shares of stock outstanding = No. = 6,00,000; and book value per share = ₹ 10. Since Gentry's product market is stable and the company expects no growth, all earnings are paid out as dividends. The debt consists of perpetual bonds. What are the Gentry's Earning per Share (EPS) and its price per share P_0 ?

Gentry can increase its debt by ₹ 80 lakhs, to a total of ₹ 1 crore, using the new debt to buy back and retire some of its shares at the current price. Its interest rate on debt will be 12% (it will have to call and refund the old debt), and its cost of equity will rise from 15% to 17% . EBIT will remain constant. Should Gentry change its capital structure?

Solution:

Calculation of EPS and Price P_0

EBIT	₹ 40,00,000
– Interest @ 10%	2,00,000
	38,00,000
–Tax@ 35%	13,30,000
	24,70,000
No. of Shares	6,00,000
EPS (or Dividend)	₹ 4.12
k_e (given)	15%
P_0 (*i.e.* D_1/k_e)	4.12/.15
	= ₹ 27.47.

If the company decides to increase debt by ₹ 80 lakhs, the company may buy back 80,00,000 ÷ 27.47 = 2,91,226 share. Thereafter, the remaining number of shares would be 3,08,774 (*i.e.* 6,00,000 -2,91,226). The market price of the share may be ascertained as follows :

EBIT	₹ 40,00,000
– Int @ 12% on ₹ 1 crores	12,00,000
	28,00,000
– Tax@35%	9,80,000
	18,20,000
No. of Equity share	3,08,774
EPS (or Dividend)	₹ 5.89
k_e (given)	17%
P_0 (*i.e.* D_1/k_e)	5.89/.17
	= ₹ 34.64

As the price is expected to go up from ₹ 27.47 to ₹ 34.64, the company may change its capital structure by raising debt and retiring some shares.

Illustration 9.6

Funman Ltd. is engaged in expansion of its production capacity which is expected to increase the operating profits from 20% to 25%. The proposal requires additional funds of ₹ 1,00,00,000 for which different alternatives of raising funds are being evaluated. These are :

	Option I	Option II	Option III	Option IV
14% Pref. Sh. Capital	₹ 20,00,000	₹ 20,00,000	—	₹ 10,00,000
Equity Share Capital	40,00,000	20,00,000	20,00,000	50,00,000
14% Partly Conv. Debentures	—	—	30,00,000	—
16% Debentures	—	20,00,000	—	40,00,000
20% Term Loan	—	40,00,000	50,00,000	—
22% Term Loan	40,00,000	—	—	—
	1,00,00,000	1,00,00,000	1,00,00,000	1,00,00,000

Additional Information :

(*i*) The Company belongs to 30% tax bracket.

(*ii*) The 50% of the partly covertible debentures are to be converted into Equity share capital at par at the end of 4th year.

Evaluate different options of raising the required funds in view of the fact that the firm wants to maximise the dividends to the shareholders (100% payment ratio) and the period of 3 years is considered sufficient for capital structure division.

Solution :

In this case, the firm has different options of capital structure. In option III, the partly convertible debentures are to be converted in equity shares only after 5 years. But the period of 3 years is considered sufficient for capital structure decision. Therefore, the conversion of partly convertible debentures after 5 years becomes irrelevant. The return to equity shareholder under different options may be found as follows :

	Option I	Option II	Option III	Option IV
Capital Employed	₹ 100,00,000	₹ 100,00,000	₹ 100,00,000	₹ 100,00,000
Operating Profit @ 25%	25,00,000	25,00,000	25,00,000	25,00,000
Less Int. on 14% Partly Conv. Debentures	—	—	4,20,000	—
Int. on 16% Debentures	—	3,20,000	—	6,40,000

	Option I	Option II	Option III	Option IV
Int. on 20% Term Loan	—	8,00,000	10,00,000	—
Int. on 22% Term Loan	8,80,000	—	—	—
Profit Before Tax	16,20,000	13,80,000	10,80,000	18,60,000
Tax @ 30%	4,86,000	5,44,000	3,24,000	5,58,000
Profit After tax	11,34,000	8,36,000	7,56,000	13,02,000
Less : Pref. Dividend	2,80,000	2,80,000	—	1,40,000
Profit for Equity Shareholders	8,54,000	5,56,000	7,56,000	11,62,000
Equity Share Capital	₹ 40,00,000	₹20,00,000	₹ 20,00,000	₹ 50,00,000
No. of Share (FV = ₹ 10)	4,00,000	2,00,000	2,00,000	5,00,000
Dividend Per Share	₹ 2.14	₹ 2.78	₹ 3.78	₹ 2.33

Option III is best because the dividend payable to equity Share is highest in this case. This is evident from the fact that in Option III, the firm has an opportunity to avail maximum benefit of cheaper debt financing.

OBJECTIVE TYPE QUESTIONS

State whether each of the following statements is ***True (T)*** *or* ***False (F)***.

(*i*) In practice, the capital structure of a firm reflects the management philosophy.

(*ii*) In capital structure analysis, only the financial risk is considered and the total risk of the firm is ignored.

(*iii*) Flexibility of capital structure refers to ability of the firm to issue additional equity share capital.

(*iv*) Debt repayment capacity is an important consideration for designing a capital structure.

(*v*) Any firm should employ as much debt as possible in the overall capitalization.

(*vi*) As debt is generally cheaper than share capital, higher leverage should always be the objective of designing the capital structure.

(*vii*) In general, the preference share capital and debt financing dilute the controlling powers of management.

(*viii*) EBIT-EPS analysis incorporates the risk of the firm in the capital structure analysis.

(*ix*) Projected cash flow analysis can be of immense help to financial manager in planning the capital structure.

(*x*) There is no agency cost of debt financing.

[**Answers :** *(i) T, (ii) F, (iii) F, (iv) T, (v) F, (vi) F, (vii) F, (viii) F, (ix) T, (x) F.*]

MULTIPLE CHOICE QUESTIONS

1. In order to design an optimal capital structure, a company should strive for :

(*a*) Maximum Debt,

(*b*) Minimum Debt,

(*c*) Minimum WACC,

(*d*) Minimum Cost of Equity.

2. Capital structure of a firm influences the :

(*a*) Risk of the firm,

(*b*) Return of the Equity Shareholder,

(*c*) Risk but not return,

(*d*) Both (*a*) and (*b*).

3. Which of the following is not considered while designing the capital structure?

(*a*) Size of the company,

(*b*) Tax rate,

(*c*) Location of the plant,

(*d*) Dilution of control.

4. Which of the following is not relevant for optimal capital structure?

(*a*) Flexibility,

(*b*) Solvency,

(*c*) Liquidity,

(*d*) Control.

5. Financial Structure refers to

(*a*) All financial resources,

(*b*) Short-term funds,

(*c*) Long-term funds,

(*d*) None of these.

6. An optimal capital structure is one when the MP of the equity share is :

(*a*) Zero,

(*b*) Maximum,

(*c*) Minimum,

(*d*) Moderate.

7. Agency cost arises due to :
   (*a*) Increase in Cost of Production,
   (*b*) Hiring more employees,
   (*c*) Increase in Debt,
   (*d*) Sales decline.
8. Which of the following is not affected by capital structure?
   (*a*) Total tax liability,
   (*b*) Return on Equity,
   (*c*) Operating Profit,
   (*d*) Earnings Per Share.
9. While increasing debt proportion in the capital structure, which one of the following should be considered?
   (*a*) Cash flow position,
   (*b*) Operating profits,
   (*c*) Financial risk,
   (*d*) All of the above.
10. Which of the following may be ignored while designing a capital structure?
   (*a*) Profitability,
   (*b*) Flexibility,
   (*c*) Control Philosophy,
   (*d*) Political Stability.
11. Maximum amount of Debt, a firm can comfortably service is known as :
   (*a*) Debt-service Coverage,
   (*b*) Debt capacity,
   (*c*) Interest charge,
   (*d*) Debt Value.
12. Cash flow required during a period to meet the interest and repayment commitments is known as :
   (*a*) Debt capacity,
   (*b*) Interest Coverage,
   (*c*) Debt-service Coverage,
   (*d*) Market Value of Debt.
13. In Pecking Order Theory, the first priority is given to :
   (*a*) Fresh Equity,
   (*b*) Fresh Loan,
   (*c*) Mix of Debt & Equity,
   (*d*) Retained Earnings.

[**Answers :** 1(*c*), 2(*d*), 3(*c*), 4(*b*), 5(*a*), 6(*b*), 7(*c*), 8(*c*), 9(*d*), 10(*d*), 11(*b*), 12(*c*), 13(*d*)].

ASSIGNMENTS

1. Write short notes on :
   (*a*) Agency cost
   (*b*) Projected cash flow analysis
2. What do you mean by appropriate capital structure? Explain with reference to the cash flow analysis.
3. Can a firm have an optimal capital structure? What do you mean by flexibility of capital structure?
4. Discuss any five factors relevant in determining the capital structure.
5. If debt is cheaper source of finance, then why every firm is not a 99% debt firm? Enumerate the legal provisions in this respect.
6. How the consideration of control affect the composition of capital structure?
7. What is financial distress? Examine the effects of financial distress on the value of the firm.
8. Explain the feature of EBIT-EPS analysis, cash flow analysis and valuation models approach to determinations of capital structure.
9. In addition to wealth considerations, what other factors might a firm consider while making capital structure decisions?
10. Explain the capital structure decision from the point of view of minimization of risk.
11. Explain briefly, the factors which influence the planning of capital structure in a business firm.
   [B.Com. (H.), D.U., 2015]
12. 'Equity shareholders provide risk capital'. Comment.
13. What do you mean by Agency Problem? How this can be resolved? *[B.Com. (H.), D.U., 2018]*

PART IV

DIVIDEND DECISION

When a firm procures funds from the investors or owners, there is an explicit or implicit promise to pay a return to them. The return to lenders is paid in the form of interest which is compulsorily payable, but return to owners which is paid generally, in the form of dividends, is optional. Does it mean then that the firm has no liability to pay dividends to the shareholders? Apparently, it is so but the shareholders provide funds in expectation of return which may be available to them either in the form of current dividends or in the form of future capital gains. From the point of view of the firm, the dividend decision is more critical because the profits, if not distributed as dividends, are retained and reinvested within the firm. For this, the firm must have sufficient viable investment proposals which have a rate of return at least equal to the opportunity cost of the shareholders. The dividend decision by any firm, like the investment and financing decisions, is also to be taken with the objective of maximization of market price of the share. However, there are differing views on the relationship between dividend payment and value of the firm. For some, dividend is relevant while for others, dividend is irrelevant for value of the firm. Part V attempts to look into different aspects of dividend decision. The learning objectives are:

- What is dividend decision and dividend policy?
- Is dividend relevant for the value of the firm? If yes, what is the relationship?
- How dividend may be considered as irrelevant for the value of the firm?
- In practice, how and in what forms the profit can be distributed by a firm?
- What are the implications of stability of dividends and informational contents of dividends?

CONTENTS

CHAPTER 10 : DIVIDEND DECISION AND VALUATION OF THE FIRM

CHAPTER 11 : DIVIDEND POLICY : DETERMINANTS AND CONSTRAINTS

CHAPTER

10

Dividend Decision and Valuation of the Firm

"Two basic school of thoughts on dividend policy have been expressed in the theoretical literature of finance. One school, associated with Myron Gordon and John Lintner, holds that the capital gains expected to result from earnings retentions are more risky than are dividend expectations. Accordingly, this school suggests that the earnings of a firm with a low payout ratio will typically be capitalized at higher rates than the earnings of a high payout firm. The other school, associated with Merton Miller & Franco Modigliani, holds that investors are basically indifferent to returns in the form of dividends or capital gains. Empirically, when firms raise or lower their dividend, their stock prices tend to rise or fall in like manner; does this not prove that investors prefer dividends ?[1]"

SYNOPSIS

- Concept and Significance.
- Dividend and Valuation of the Firm.
- Relevance of Dividend Policy.
  - Walter's Model.
  - Gordon's Model.
- Irrelevance of Dividend Policy.
  - Residuals Theory of Dividend Policy.
  - Modigliani and Miller Theory.
- Graded Illustrations in Dividend and Value of the Firm.

1. Weston J. Fred and Brigham E.F, *Managerial Finance,* The Dryden Press, Illinois, Fifth Edition, p. 698

The term dividend refers to that portion of profit (after tax) which is distributed among the owners/shareholders of the firm. The profit which is not distributed is known as retained earnings. A company may have preference share capital as well as equity share capital and dividends may be paid on both types of capital. However, there is as such, no decision involved as far as the dividend payable to preference shareholders is concerned. The reason being that the preference dividend is more or less, a contractual liability and is payable at a fixed rate. On the other hand, a firm has to consider a whole lot of factors before deciding for the equity dividend. The expected level of cash dividend, from the point of view of equity shareholders, is the key variable from which the shareholders and equity investors determine the share value. The establishment and determination of an effective dividend policy is therefore, of significant importance to the firm's overall objective. However, the development of such a policy is not an easy job. A whole gamut of considerations affecting the dividend decision is there. The dividend decision may seem to be simple enough, but it evokes a surprising amount of controversy.

Concept and Significance : The dividend decision is one of the three basic decisions which a financial manager may be required to take, the other two being the investment decisions and the financing decisions. In each period any earning that remains after satisfying obligations to the creditors, the Government, and the preference shareholders can either be retained, or paid out as dividends or bifurcated between retained earnings and dividends. The retained earnings can then be invested in assets which will help the firm to increase or at least maintain its present rate of growth. The dividend decision requires a financial manager to decide about the distribution of profits as dividends. The profits may be distributed either in the form of cash dividends to shareholders or in the form of stock dividends (also known as bonus shares) At present, only the cash dividends are being discussed and the distribution of profit in the form of bonus shares will be taken up in the next chapter.

In dividend decision, a financial manager is concerned to decide one or more of the following :

- Should the profits be ploughed back to finance the investment decisions?
- Whether any dividend be paid? If yes, how much dividends be paid?
- When these dividends be paid? Interim or Final ?
- In what form the dividends be paid? Cash dividend or Bonus Shares?

All these decisions are inter-related and have bearing on the future growth plans of the firm. If a firm pays dividends, it affects the cash flow position of the firm but earns a goodwill among the investors who therefore, may be willing to provide additional funds for the financing of investment plans of the firm. On the other hand, the profits which are not distributed as dividends become an easily available source of funds at no explicit costs. However, in the case of ploughing back of profits, the firm may loose the goodwill and confidence of the investors and may also defy the standards set by other firms. Therefore, in taking the dividend decision, the financial manager has to consider and analyze various factors. Every aspects of dividend decision is to be critically evaluated. The most important of these considerations is to decide as to what portion of profit should be distributed. This is also known as the dividend payout ratio.

Dividend Policy and Value of the Firm : Dividend policy is basically concerned with deciding whether to pay dividend in cash now, or to pay increased dividends at a later stage or distribution of profits in the form of bonus shares. The current dividend provides liquidity to the investors but the bonus share will bring capital gains to the shareholders. The investor's preferences between the current cash dividend and the future capital gain have been viewed differently. Some are of the opinion that the future capital gain are more risky than the current dividends while others argue that the investors are indifferent between the current dividend and the future capital gains.

The basic question to be resolved while framing the dividend policy may be stated simply : What is sound rationale for dividend payments? In the light of the objective of maximizing the value of the share, the question may be restated as follows : Given the firm's investments and financing decisions, what is the effect of the firm's dividend policies on the share price? Does a high dividend payment decrease, increase or does not affect at all the share price. In the first instance, it may be argued that the dividend policy is important. The value of the share is defined to be equal to the present value of expected future dividends. So, how can now be suggested that the dividend is not relevant? The dividend policy has been a controversial issue among the financial managers and is often referred to as a ***dividend puzzle***.

Different models have been proposed to evaluate the dividend policy decision in relation to value of the firm. While agreement is not found among the models as to the precise relationship, it is still worth while to examine some of these models to gain insight into the effect which the dividend policy might have on the market price of the share and hence on the wealth of the shareholders. Two schools of thoughts have emerged on the relationship between the dividend policy and value of the firm.

One school associated with Walter, Gordon, *etc.*, holds that the future capital gains (expected to result from lower current dividend payout) are more risky and the investors have preference for current dividends. The investors do have a tilt towards those firms which pay regular dividend. So, the dividend payment affects the market value of the share and as a result the dividend policy is relevant for the overall value of the firm. On the other hand, the other school of thought associated with Modigliani and Miller holds that the investors are basically indifferent between current cash dividends and future capital gains. Both these schools of thought on the relationship between dividend policy and value of the firm have been discussed as follows :

RELEVANCE OF DIVIDEND POLICY

Generally, the firms pay dividends and view such dividend payments positively. The investors also expect and like to receive dividend income on their investments. The firms not paying dividends may be adversely rated by the investors affecting thereby the market value of the share. The basic argument of those supporting the dividend relevance is that current cash dividends reduce investors uncertainty, the investors will discount the firm's earnings at a lower rate, k_e, thereby placing a higher value on the shares. If dividends are not paid then the uncertainty of shareholders/investors will increase, raising the required rate of return, k_e, resulting in relatively lower market price of the share. So, it may be argued that the dividend policy has an effect on the market value of the share and the value of the firm. A firm should pay a dividend to shareholders to fulfil the expectations of the shareholders in order to maintain or increase the market price of the share. Two models representing this argument may be discussed here.

1. WALTER'S MODEL : Walter J.E. supports the view that the dividend policy has a bearing on the market price of the share and has presented a model to explain the relevance of dividend policy for valuation of the firm based on the following assumptions :

(*i*) All investment proposals of the firm are to be financed through retained earnings only and no external finance is available to the firm.

(*ii*) The business-risk complexion of the firm remains same even after fresh investment decisions are taken. In other words, the rate of return on investment *i.e.,* '*r*' and the cost of capital of the firm *i.e.,* k_e, are constant.

(*iii*) The firm has an infinite life.

This model considers that the investment decision and dividend decision of a firm are inter-related. A firm should or should not pay dividends depends upon whether it has got the suitable investment opportunities to invest the retained earnings or not. This model can now be presented as follows :

If a firm pays dividends to shareholders, they in turn, will invest this income to get further returns. This expected return to shareholders is the opportunity cost of the firm and hence the cost of capital, k_e, to the firm. On the other hand, if the firm does not pay dividends, and instead retains, then these retained earnings will be reinvested by the firm to get return on these investment. This rate of return on the investment, r, of the firm must be at least equal to the cost of capital, k_e. If $r = k_e$, the firm is earning a return just equal to what the shareholders could have earned, had the dividends been paid to them.

However, what happen if the rate of return, r, is more than the cost of capital, k_e ? In such a case, the firm can earn more by retaining the profits, than the shareholders can earn by investing their dividend income. The Walter's model, thus, says that if $r > k_e$, the firm should refrain from dividends and should reinvest the retained earnings and thereby increase the wealth of the shareholders. However, if the investment opportunities before the firm to reinvest the retain earnings are expected to give a rate of return which is less than the opportunity cost of the shareholders of the firm, then the firm should better distribute the entire profits. This will give opportunity to the shareholders to reinvest this dividend income and get higher returns.

In nutshell, therefore, the dividend policy of a firm depends upon the relationship between r & k. If $r > k_e$ (*i.e.,* a case of a growth firm), the firm should have zero payout and reinvest the entire profits to earn more than the investors. If however, $r < k_e$, then the firm should have 100% payout ratio and let the shareholders reinvest their dividend income to earn higher returns. If 'r' happens to be just equal to k_e, the shareholders will be indifferent whether the firm pays dividends or retains the profits. In such a case, the returns to the firm from reinvesting the retained earnings will be just equal to the earnings available to the shareholders on their investment of dividend income.

Thus, a firm can maximize the market value of its share and the value of the firm by adopting a dividend policy as follows :

(*i*) If $r > k_e$, the payout ratio should be zero (*i.e.,* retention of 100% profit). Higher the retention, higher would be the price

(*ii*) If $r < k_e$, the payout ratio should be 100% and the firm should not retain any profit, Higher the dividend, higher would be the price, and

(*iii*) If $r = k_e$, the dividend is irrelevant and the dividend policy is not expected to affect the market value of the share.

In order to testify the above, Walter has suggested a mathematical model *i.e.,*

$$P = \frac{D}{k_e} + \frac{(r/k_e)(E - D)}{k_e}$$

where , P = Market price of Equity share.
D = Dividend per share paid by the Firm.
r = Rate of return on Investment of the Firm.
k_e = Cost of Equity share capital, and
E = Earnings per share of the Firm.

As per the above formula, the market price of a share is the sum of two components *i.e.,*

(*i*) The present value of an infinite stream of dividends, and

(*ii*) The present value of an infinite stream of return from retained earnings.

Thus, the Walter's formula shows that the market value of a share is the present value of the expected stream of dividends and capital gains. The effect of varying payout ratio on the market price of the share under different rate of returns, r, have been shown in Example 10.1.

Example 10.1

The following information is available in respect of ABC Ltd.

Earning per share (EPS or E) = ₹ 10 (Constant)
Cost of Capital, k_e, = .10 (Constant)

Find out the market price of the share under different rate of return, r, of 8%, 10% and 15% for different payout ratios of 0%, 40%, 80%, and 100%.

Solution :

The market price of the share as per Walter's model may be calculated for different combinations of rate of return and dividend payout ratios (the earnings per share, E, and the cost of capital, k_e, taken as constant) as follows :

If the rate of return, r, = 15% and the dividend payout ratio is 40%, then

$$P = \frac{D}{k_e} + \frac{(r/k_e)(E-D)}{k_e}$$

$$P = \frac{4}{.10} + \frac{(.15/.10)(10-4)}{.10}$$

$$= 40 + 90 = 130$$

Similarly, if r = 8% and Dividend Payout ratio = 80%, then

$$P = \frac{8}{.10} + \frac{(.08/.10)(10-8)}{.10}$$

$$= 80 + 16 = 96$$

The expected market price of the share under different combinations of 'r' and payout ratio have been calculated and presented in Table 10.1.

TABLE 10.1: MARKET PRICE UNDER WALTER'S MODEL FOR DIFFERENT COMBINATIONS OF 'r' AND PAYOUT RATIO.

		r = 15%	r = 10%	r = 8%
D/P Ratio	0%	₹ 150	₹ 100	₹ 80
	40%	130	100	88
	80%	110	100	96
	100%	100	100	100

It may be seen from Table 10.1 that for a growth firm (r = 15% and $r > k_e$), the market price is highest at ₹ 150 when the firm adopts a zero payout and retains the entire earnings. As the payout increases gradually from 0% to 100%, the market price tends to decrease from ₹ 150 to ₹ 100. For a firm having $r < k_e$ (*i.e.*, r = 8%), the market price is highest when the payout ratio is 100% and the firm retains no profit. However, if $r = k_e = 10\%$, then the price is constant at ₹ 100 for different payout ratios. Such a firm does not have any optimum payout ratio and every payout ratio is as good as any other.

Critical Appraisal : The Walter's model provides a theoretical and simple frame work to explain the relationship between dividend policy and value of the firm. As far as the assumptions underlying the model hold good, the behaviour of the market price of the share in response to the dividend policy of the firm can be explained with the help of this model. However, the limitation of this model is that these underlying assumptions are unrealistic. The financing of investment proposals only by retained earnings and no external financing is seldom found in real life. The assumption of constant 'r' and constant 'k_e', is also unrealistic and does not hold good. As more and more investment are made, the risk complexion of the firm will change and consequently the k_e may not remain constant.

2. GORDON'S MODEL : Myron Gordon has also proposed a model suggesting that the dividend policy is relevant and can affect the value of the share and that of the firm. This model is also based on the assumptions similar to that made in Walter's model. However, two additional assumptions made by this model are as follows :

(*i*) The growth rate of the firm 'g', is the product of its retention ratio, b, and its rate of return, r, *i.e.*, g = br, and

(*ii*) The cost of capital besides being constant is more than the growth rate *i.e.*, $k_e > g$.

Gordon argues that the investor do have a preference for current dividends and there is a direct relationship between the dividend policy and the market value of the share. He has built the model on the basic premise that the investors are basically risk averse and they evaluate the future dividends/ capital gains as a risky and uncertain proposition. Dividends are more predictable than capital gains; management can control dividends but it cannot dictate the market price of the share. Investors are certain of receiving incomes from dividends than from future capital gains. The incremental risk associated with capital gains implies a higher required rate of return for discounting the capital gains than for discounting the current dividends. In other words, an investor values, current dividends more highly than an expected future capital gain.

So, the *"bird-in-the-hand"* argument of this model suggests that the dividend policy is relevant as the investors prefer current dividends as against the future uncertain capital gains. When the investors are certain about their returns, they discount the firm's earnings at a lower rate and therefore, placing a higher value for the share and that of the firm. So, the investors require a higher rate of return as retention rate increases and this would adversely affect the share price.

Thus, Gordon's model is a share valuation model (like that of Walter's). Under this model, the market price of a share can be calculated as follows :

$$P = \frac{E(1-b)}{k_e - br}$$

where, P = Market price of Equity share.
E = Earnings per share of the Firm.
b = Retention Ratio (1 – Payout ratio).
r = Rate of return on Investment of the Firm.
k_e = Cost of Equity share capital, and
br = g *i.e.*, Growth rate of the firm.

This model shows that there is a relationship between payout ratio (*i.e.*, 1–b), cost of capital k_e, rate of return, r, and the market value of the share. This can be explained with the help of Example 10.2.

Example 10.2

The following information is available in respect of XYZ Ltd.

Earning per share (EPS or E) = ₹ 10 (Constant)
Cost of Capital, k_e, = .10 (Constant)

Find out the Market price of the share under different rate of return, r, of 8%, 10% and 15% for different payout ratios of 0%, 40%, 80%, and 100%.

Solution :

The market price of the share as per Gorden's model may be calculated as follows :

If r = 15% and payout ratio is 40%, then the retention ratio, b, is .6 (*i.e.,* 1 – .4) and the growth rate, g = br = .09 (*i.e.,* .6 × .l5) and the market price of the share is :

$$P = \frac{E(1-b)}{k_e - br}$$

$$P = \frac{10\,(1-.6)}{.10-.09} = ₹\,400$$

If r = 8% and payout ratio is 80%, then the retention ratio, b, is .2 (*i.e.,* 1 – .8) and the growth rate, g = br = .016 (*i.e.,* .2×.08) and the market price of the share is :

$$P = \frac{10\,(1-.2)}{.10-.016} = ₹\,95$$

Similarly, the expected market price under different combinations of 'r' and dividend payout ratio have been calculated and placed in Table 10.2.

TABLE 10.2 : MARKET PRICE UNDER GORDON'S MODEL FOR DIFFERENT COMBINATIONS OF 'r' AND PAYOUT RATIO.

D/P Ratio	r = 15%	r = 10%	r = 8%
0%	0	0	0
40%	₹ 400	₹ 100	₹ 77
80%	114.3	100	95
100%	100	100	100

On the basis of figures given in Table 10.2, it can be seen that if the firm adopts a zero payout then the investor may not be willing to offer any price. For a growth firm (*i.e.,* $r > k_e > br$), the market price decreases when the payout ratio is increased. For a firm having $r < k_e$, the market price increases when the payout ratio is increased.

If $r = k_e$, the dividend policy is irrelevant and the market price remains constant at ₹ 100 only. However, Gordon has argued that even if $r = k_e$, the dividend payout ratio matters and the investors being risk averse prefer current dividends which are certain to future capital gains which are uncertain. The investors will apply a higher capitalization rate *i.e.,* k_e to discount the future capital gains. This will compensate them for the future uncertain capital gain and thus, the market price of the share of a firm which retains profit will be adversely affected.

Gordon's conclusion about the relationship between the dividend policy and the value of the firm are similar to that of Walter's model. The similarity is due to the reason that the underlying assumptions of both the models are same.

IRRELEVANCE OF DIVIDEND POLICY

The other school of thought on dividend policy and valuation of the firm argues that what a firm pays as dividends to shareholders is irrelevant and the shareholders are indifferent about receiving current dividends or receiving capital gains in future. The advocates of this school of thought argue that the dividend policy has no effect on the market price of a share. The shareholders do not differentiate between the present dividend or future capital gains. They are basically interested in higher returns either earned by the firm by reinvesting profits in profitable investment opportunity or earned by themselves by making investment of dividend income. The underlying intuition for the dividend irrelevance proposition is simple : Firms that pay more dividends offer less price appreciation but provide the same total return to shareholders, given the risk characteristics of the firm. The investors should be indifferent of receiving their returns in the form of current dividends or in the form of increase in the market price of the share.

The dividends irrelevance argument is based on two preconditions : (*i*) That investment and financing decisions have already been made and that these decisions will not be altered by the amount of dividends payment, and (*ii*) That the perfect capital market is there in which an investor can buy and sell the shares without any transaction cost and that the companies can issue shares without any flotation cost. Two theories have been discussed here to focus on the irrelevance of dividend policy for valuation of the firm though it is well accepted that like the capital structure irrelevance proposition, the dividend irrelevance argument has its roots in the Modigliani-Miller Analysis.

1. RESIDUALS THEORY OF DIVIDENDS : This theory is based on the assumption that either the external financing is not available to the firm or if available, cannot be used due to its excessive costs for financing the profitable investment opportunities of the firm. Therefore, the firm finances its investment decisions by retaining profits. The quantum of profits to be distributed is a balancing figure and thus depends upon what portions of profits is to be retained. If a firm has sufficient profitable investment opportunities, then the wealth of the shareholders will be maximized by retaining profits and reinvesting them in the financing of investment opportunities either by reducing or even by paying no dividend to the shareholders. If a firm has no such investment opportunity, then the profits may be distributed among the shareholders.

Thus, if a firm chooses to issue securities than retaining profits, a larger amount of the issue is required to receive the net amount for the investment. For example, if ₹ 50,00,000 is needed to finance the proposed investment and the flotation cost is 20%, then the firm will be required to make an issue of ₹ 62,50,000, so that the net proceeds with the company are ₹ 50,00,000. This means that the new capital will be more expensive than the retention of earnings. In effect, the flotation cost eliminates the indifference between financing by internal capital (*i.e.,* retention) and new issue. Given the flotation cost, dividends would be paid only if profits are not completely used for investment purposes *i.e.,* only when the firm has some residual earnings after the financing of new investments. This is referred to as the *Residuals Theory* of dividends.

Thus, a firm does not decide as to how much dividends be paid rather it decides as to how much profits should be retained. The profits not required to be retained may be distributed as dividends. Therefore, dividend decision is a passive decision.

The dividends are a distribution of residual profits after retaining sufficient profit for financing the available opportunities. Under the Residuals Theory, the firm would treat the dividend decision in three steps :

(*i*) Determining the level of capital expenditures which is determined by the investment opportunities.

(*ii*) Using the optimal financing mix, find out the amount of equity financing needed to support the capital expenditure in step (*i*) above.

(*iii*) As the cost of retained earnings, k_r, is less than the cost of new equity capital, the retained earnings would be used to meet the equity portions financing in step (*ii*) above. If the available profits are more than this need, then the surplus may be distributed as dividends to shareholders. As far as the required equity financing is in excess of the amount of profits available, no dividends would be paid to the shareholders.

In the Residuals Theory, the dividends policy is influenced by (*i*) the company's investment opportunities, and (*ii*) the availability of internally generated funds, where dividends are paid only after all acceptable investment proposals have been financed. The dividend policy is totally passive in nature and has no direct influence on the market price of the share. So, the Residuals Theory treats the dividend as a passive decision determined by the availability of profitable investments. Consequently, the dividends may fluctuate from one year to an other depending upon the investment opportunity. But the shareholders do not show any concern to the fluctuations in dividends as they are compensated for reduction in dividends or no dividends at all by future capital gains. The market price of the share is still taken as the present value of all future dividends and the pattern of these dividends does not matter.

2. MODIGLIANI AND MILLER APPROACH : The irrelevance of dividend policy for valuation of the firm has been most comprehensively presented by Modigliani and Miller (MM). They have argued that the market price of a share is affected by the earnings of the firm and is not influenced by the pattern of income distribution. The dividend policy is immaterial and is of no consequence to the value of the firm. What matters, on the other hand, is the investment decisions which determine the earnings of the firm and thus affect the value of the firm. They argue that subject to a number of assumptions, the way a firm splits its earnings between dividends and retained earnings has no effect on the value of the firm.

Assumptions of the MM Approach : The MM approach to irrelevance of dividend is based on the following assumptions :

(*i*) The capital markets are perfect and the investors behave rationally.

(*ii*) All informations are freely available to all the investors.

(*iii*) There is no transaction cost and no time lag.

(*iv*) Securities are divisible and can be split into any fraction.

(*v*) There are no taxes and no flotation cost.

(*vi*) The firm has a defined investment policy and the future profits are known with certainty. The implication is that the investment decisions are unaffected by the dividend decision and operating cash flows are same no matter which dividend policy is adopted.

The Model : Under the assumptions stated above, MM argue that neither the firm paying dividends nor the shareholders receiving the dividends will be adversely affected by firms paying either too little or too much dividends. They have used the arbitrage process to show that the division of profits between dividends and retained earnings is irrelevant from the point of view of the shareholders. The Model shows that given the investment opportunities, a firm will finance these either by ploughing back profits or if pays dividends, then will raise an equal amount of new share capital externally by selling new shares. The amount of dividends paid to existing shareholders will be replaced by new share capital raised externally. The benefit of increase in market value as a result of dividend payment will be offset completely by the decrease in terminal value of the share. The shareholders therefore, would be indifferent between the dividend payments or retaining the profits. In order to testify their argument, MM have presented the following valuation model :

$$P_0 = \frac{1}{(1 + k_e)} \times (D_1 + P_1) \qquad (10.1)$$

where, P_0 = Present market price of the share

k_e = Cost of equity share capital

D_1 = Expected dividend at the end of year 1

P_1 = Expected market price of the share at the end of year 1

If the company has 'n' number of equity shares outstanding then the value of the firm is n times P_0, or

$$nP_0 = \frac{1}{(1 + k_e)} \times (nD_1 + nP_1) \qquad (10.2)$$

Now, the company can, finance its investment proposal either by retained earnings or by sale of new shares. Say, the company plans to issue 'm' number of equity shares at a price P_1 are arising funds equal to mP_1, to finance the investment opportunities at the end of year 1. The value of the firm, therefore, may be defined as

$$nP_0 = \frac{1}{(1 + k_e)} \times [nD_1 + nP_1 + mP_1 - mP_1]$$

$$nP_0 = \frac{1}{(1 + k_e)} \times [nD_1 + (n+m)P_1 - mP_1] \qquad (10.3)$$

It may be observed that mP_1 in Equation 10.3 is equal to the funds raised by the firm by the issue of new shares at year 1. This is also equal to the total investment at the end of year 1 less the amount of retained earnings, or

$$mP_1 = I - (E - nD_1)$$

$$= I - E + nD_1 \qquad (10.4)$$

where, I = Total investment to be made at year 1

E = Total earnings of the firm.

Equation 10.4 simply states that the firm must issue fresh capital of an amount equal to total requirement for investment as reduced by the profit retained. And, the profits

retained depends upon the amount of dividends paid *i.e.*, nD_1. So, whatever of capital funds needs is not financed by retained earnings (*i.e.*, $E–nD_1$) must be financed by the issue of fresh share capital. Substituting the Equation 10.4 into Equation 10.3,

$$\begin{aligned} nP_0 &= \frac{1}{(1+k_e)} \times [nD_1 + (n+m)P_1 - (I - E + nD_1)] \\ &= \frac{1}{(1+k_e)} \times [nD_1 + (n+m)P_1 - I + E - nD_1] \\ &= \frac{1}{(1+k_e)} \times [(n+m)P_1 - I + E] \qquad (10.5) \end{aligned}$$

Since, D_1 is not found in Equation 10.5 and other variables *i.e.*, $(n+m)P_1$, I, E and k_e, are all independent of D, MM have concluded that the value of the firm, nP_0, does not depend on the dividend decision and hence the dividend policy is irrelevant.

Under MM Model, the number of new equity shares, m, to be issued can be found as follows :

$$m = [I - (E - mD_1)] \div P_1$$

It may be noted that there will not be any change in the MM proposition whether the new funds are raised by the issue of fresh shares or by the issue of debt securities. In the capital structure irrelevance theorem (as discussed in Chapter 8), the MM model has shown that the financing mix is irrelevant for the value of the firm.

The success of the MM model depends upon the arbitrage process *i.e.*, replacement of amount paid as dividend by the issue of fresh capital. The arbitrage process involves two simultaneous actions. With reference to dividend policy, these two actions are :

(*i*) Payment of dividend by the firm, and

(*ii*) Raising of fresh capital.

With the help of arbitrage process, MM have shown that the dividend payment will not have any effect on the value of the firm. Even if the firm pays dividends, resulting in a increase in market value of the share, the effect on the value of the firm will be neutralized by the decrease in terminal value of the share. The working of the arbitrage process may be substantiated as follows :

Say, a firm has 1,00,000 shares outstanding and is planning to declare a dividend of ₹ 5 at the end of current financial year. The present market price of the share is ₹ 100. The cost of equity capital, k_e, may be taken at 10%. The expected market price at the end of the year 1 may be found under two options : (*i*) if dividend of ₹ 5 is paid, and (*ii*) if dividend is not paid, as follows:

1. If dividend of ₹ 5 is paid (the value of D_1 is 5) :

$$\begin{aligned} P_0 &= \frac{1}{(1+k_e)} \times (D_1 + P_1) \\ P_0(1+k_e) &= D_1 + P_1 \\ P_1 &= P_0(1+k_e) - D_1 \\ &= 100\,(1.10) - 5 = 105. \end{aligned}$$

So, the market price of the share is expected to be ₹ 105, if the firm pays dividend of ₹ 5.

2. If dividend of ₹ 5 is not paid (the value of D_1 is 0):

$$\begin{aligned} P_0 &= \frac{1}{(1+k_e)} \times (D_1 + P_1) \\ P_0(1+k_e) &= D_1 + P_1 \\ P_1 &= P_0(1+k_e) - D_1 \\ &= 100\,(1.10) = 110. \end{aligned}$$

So, the market price of the share is expected to be ₹ 110, if the firm does not pay dividend of ₹ 5.

However, in both the cases, the position of the shareholders would be same. A shareholder having, say, 1 share will be having same worth of his holding whether the firm pays dividend or not. In case, the dividend of ₹ 5 is paid, he will receive ₹ 5 from the firm as dividend and the market price of the share would be ₹ 105, giving a total worth of ₹ 110. In case, the dividend is not paid then the market price of the share or the worth of the shareholder would be still ₹ 110. So, the shareholder would be indifferent whether dividend is paid or not to him. The same example can be extended further to analyze the effect of arbitrage process employed by the firm.

Say, the firm has total profits of ₹ 10,00,000 during the year 1 and is planning to make an investment of ₹ 20,00,000 at the end of the year 1. The arbitrage process and value of the firm may be explained as follows :

1. If dividend of ₹ 5 is paid by the firm at the end of the year 1 :

Total Earnings	₹ 10,00,000
Dividends paid (1,00,000 × ₹ 5)	5,00,000
Retained Earnings	5,00,000
Total funds required for investment	20,00,000
Therefore, fresh capital to be issued	15,00,000
Market price at the end of the year 1	105
Number of shares to be issued (15,00,000/105)	14,285.71
Total number of shares (1,00,000+14,285.71)	1,14,285.71

Applying Equation 10.5, the value of the firm, nP_0 is :

$$\begin{aligned} nP_0 &= \frac{1}{(1+k_e)} \times [(n+m)P_1 - I + E] \\ &= \frac{1}{(1+.10)} \times [(1,14,285.71)105 - 20,00,000 + 10,00,000] \\ &= \frac{1}{(1+.10)} \times [120,00,000 - 20,00,000 + 10,00,000] \\ &= ₹\ 100,00,000 \end{aligned}$$

2. If dividend of ₹ 5 is not paid by the firm at the end of the year 1:

Total Earnings	₹ 10,00,000
Dividends paid	—
Retained Earnings	10,00,000
Total funds required for investment	20,00,000
Therefore, fresh capital to be issued	10,00,000
Market price at the end of the year 1	110
Number of share to be issued (10,00,000/110)	9,090.9
Total number of shares (1,00,000+9,090.9)	1,09,090.9

Applying Equation 10.5, the value of the firm, nP_0 is :

$$nP_0 = \frac{1}{(1 + k_e)} \times [(n+m)P_1 - I+E]$$

$$= \frac{1}{(1+.10)} [(1,09,090.9)\ 110–20,00,000+10,00,000]$$

$$= \frac{1}{(1+.10)} [1,20,00,000 - 20,00,000+10,00,000]$$

$$= ₹\ 100,00,000$$

So, the value of the firm remains same at ₹ 100,00,000 whether the dividend is paid or not. With the help of arbitrage process, as explained above, it can be shown that the dividend policy is irrelevant for the valuation of the firm. Dividend payment does not affect the value of the firm.

It may be noted that the Equation 10.5, as used above, gives the current market value of the firm, *i.e.*, nP_0. The MM model shows that whether dividend is paid or not at the end of current year, the present market value of the firm remains same at ₹ 100,00,000. The same example can be expanded to find out the expected market value of the firm at the end of current year as follows :

(*a*) **If dividend of ₹ 5 is paid :**

Total number of shares	1,14,285.71
Market price, P_1	₹ 105
Total market value (1,14,285.71 × 105)	₹ 1,20,00,000

(*b*) **If dividend of ₹ 5 is not paid :**

Total number of shares	1,09,090.90
Market price, P_1	₹ 110
Total market value (1,09,090.90 × 110)	₹ 1,20,00,000

Thus, the expected market value at the end of current year is same at ₹ 1,20,00,000, whether the firm pays dividend of ₹ 5 or not. The MM model shows therefore, that the current market value or the expected market value of the firm, both are unaffected by the dividend decision of the firm.

Critical Appraisal : Under the assumptions set by MM, this model testifies that dividend is irrelevant and the investors are indifferent between the current dividends and the future capital gains. Given these assumptions, the effect of a dividend decision may be stated as : That there is no relationship between dividend policy and value of the share. One dividend policy is as good as another. Investors are concerned only with total returns and are indifferent whether these returns are coming as dividend income or from capital gains.

The critics of MM model argue that the assumptions underlying the model are unrealistic and vulnerable and have disputed the validity of dividend irrelevance. The assumptions needed to arrive at the dividend irrelevance may seem so onerous that these may be rejected outrightly. In particular, the MM model may be criticized as follows :

(*i*) The assumption of perfect capital market is theoretical in nature as the perfect capital market is never found in practice.

(*ii*) No flotation cost and no time lag assumptions are also unrealistic. In reality, the fact is otherwise and companies have to incur expenses in raising fresh equity capital from the market and that too requires a time gap to fulfil a lot of legal formalities for raising capital, *etc.*

(*iii*) Similarly, the assumption of no transaction costs is imaginary. Some brokerage or commission *etc.* is payable by the investors whenever they decide in future to encash future capital gain arising out of bonus shares. Hence, the investors may prefer current dividend.

(*iv*) Assumption of no tax is also questionable. There is generally a difference in tax rate applicable to dividend incomes and capital gains in the hands of the shareholders. For example, in India, the dividend income is non-taxable in the hands of the shareholders while they are required to paid taxes at a flat rate of 20% on capital gains arising out of sale of shares. Moreover, the cost of bonus shares is taken as *nil* with the result that whole of the selling price of bonus shares is treated as capital gains resulting in substantial tax liability of the shareholders. Therefore, the investors may have a preference for current dividends as against the expected capital gains.

(*v*) MM have assumed that the investment policy of the firm is independent of the financing policy. But, some of the firms may undertake only limited investment projects which can be financed by retained earnings only. Some companies, even if they are willing, may not find conducive conditions to raise capital from the market. There may be legal constraints in raising capital or the investors may be less willing to subscribe to the fresh capital. In such situations, the firm will have a tendency to retain as much profits as possible by lowering the payout ratio.

(*vi*) The MM model may not hold good if the firm is not able to issue additional equity share capital at the then prevailing current market price when dividends are paid and are to be replaced by fresh funds. These new shares would possibly be offered in the capital market and can be sold at a price lower than the then prevailing current market price. Consequently, the firm would be required to sell more shares. Thus, the firm may find the retention of profits as a better option than paying dividends to shareholders and simultaneously raising fresh capital.

Thus, the MM model is not a practical proposition. The dividend irrelevance argument does not seem to be feasible when the assumptions underlying the MM model are relaxed.

Conclusion : The discussion of different models is indicative of the fact that investors do prefer current dividend to retained earnings. The reason for this is obvious that the present dividends are certain. Investors assign higher value to certain stream of dividends. A financial manager should also recognize the existence of different types of investors. A low payout and consequently higher retention with higher expected growth will attract and satisfy the risk oriented investors while the high payout and consequently low retention and low growth rate will attract and satisfy the risk averse and conservative investors.

Therefore, neither 100% payout nor 0% payout will bring the maximum market price. The optimum point lies somewhere in between. Too much payment inspite of reinvestment opportunities causes the investor to penalize the share price

while too little payout also causes the investors to penalize the share price. Still the dividend payout ratio should be lower among the firms having good growth opportunities than the dividend payout ratio among those firms which have less opportunities of growth.

POINTS TO REMEMBER

- Dividend decision is another important decision which a financial manager has to take.
- Basically, dividend decision involves the bifurcation of profits of the firm into Dividends and Retained earnings. The dividend decision is also referred to as the dividend policy.
- There has been a difference of opinion on the effect of dividend policy on the value of the firm. Two schools of throught have emerged on the relationship between the dividend policy and value of the firm.
- On one hand, there are a few models (*e.g.* Walters Model and Gordons Model which consider dividend as relevant for the value of the firm. The argument lies on the fact that investors do have a preference for current dividend as these are more certain than the future dividends.
- On the other hand, the Residuals Theory and the MM Model argue that dividend is irrelevant for the value of the firm. What is more important is the retention of profit for the reinvestment. What is not retained is distributed.
- MM Model has introduced arbitrage process to prove that the value of the firm remain same whether the firm pays dividends or not.
- MM Model involves an arbitrage between payment of dividend and issue of fresh capital.
- The MM Model is based on certain hypothetical assumptions and so it is not a practical proposition.
- The market price under different models may be ascertained as follows :

Walter's Model	P	$= \frac{D}{k_e} + \frac{(r/k_e)(E - D)}{k_e}$
Gordon's Model	P	$= \frac{E(1-b)}{k_e - br}$
MM Model	P_0	$= \frac{1}{(1 + k_e)} \times (D_1 + P_1)$

GRADED ILLUSTRATIONS

Illustration 10.1

Following are the details regarding three companies A Ltd., B Ltd. and C Ltd.:

A Ltd.	B Ltd.	C Ltd.
$r = 15\%$	$r = 5\%$	$r = 10\%$
$k_e = 10\%$	$k_e = 10\%$	$k_e = 10\%$
$E = ₹ 8$	$E = ₹ 8$	$E = ₹ 8$

Calculate the value of an equity share of each of these companies applying Walter's formula when dividend payment ratio (D/P ratio) is : (*a*) 25%, (*b*) 50%, (*c*) 75%.

What conclusions do you draw ? *[B.Com.(H.), D.U., 2013]*

Solution :

VALUE OF AN EQUITY SHARE AS PER WALTER'S FORMULA

$$P = \frac{D}{k_e} + \frac{(r/k_e)(E - D)}{k_e}$$

	A	B	C
(*i*) **When D/P ratio is 25%**	P = ₹ 110	P = ₹ 50	P = ₹ 80
(*ii*) **When D/P ratio is 50%**	P = ₹ 100	P = ₹ 60	P = ₹ 80
(*iii*) **When D/P ratio is 75%**	P = ₹ 90	P = ₹ 70	P = ₹ 80

Conclusion : A Ltd. This company is a growth firm. The rate of return is higher than the cost of capital (*i.e.*, $r > k_e$). It will be better to retain the earnings rather than distributing in term of dividends, for maximizing the equity shareholder's wealth. The value of the share is the highest (₹ 110) when D/P ratio is at its lowest (*i.e.*, 25%)

B Ltd. This company is a "declining firm". The rate of return is less than the cost of capital (*i.e.*, $r < k_e$). It will, therefore, be appropriate for this company to distribute the earnings among its shareholders rather than retaining. The value of share of this company goes on increasing with every increase in the D/P ratio.

C Ltd. This may be characterized as a "normal firm". In case of this company $r = k_e$. Hence, D/P ratio does not have any impact on the value of the company's shares. The value of the share continues to be ₹ 80 in all three situations.

Illustration 10.2

The earnings per share of a share of the face value of ₹ 100 of PQR Ltd. is ₹ 20. It has a rate of return of 25%. Capitalization rate of its risk class is 12.5%. If Walter's model is used :

(*a*) What should be the optimum payout ratio?

(*b*) What should be the market price per share if the payout ratio is zero?

(*c*) Suppose, the company has a payout of 25% of EPS, what would be the price per share?

Solution :

As per Walter's formula, the price of the share is :

$$P = \frac{D}{k_e} + \frac{(r/k_e)(E-D)}{k_e}$$

(*a*) If $r > k_e$, the value of share will increase with every increase in retention. The price of the share would be the maximum when the firm retains all the earnings. Thus, the optimum payout ratio is zero for PQR Ltd.

(*b*) **Calculation of market price when the payout ratio is zero:**

$$P = \frac{0 + (.25/0.125)(20)}{0.125} = ₹ 320$$

(*c*) **Payout of 25% of EPS i.e., 25% of ₹ 20 = ₹ 5 per share :**

$$P = \frac{D}{k_e} + \frac{(r/k_e)(E-D)}{k_e}$$

$$= \frac{5+(.25/0.125)(20-5)}{0.125} = ₹ 280$$

Illustration 10.3

The earnings per share of ABC Ltd. is ₹ 10 and rate of capitalization applicable to it is 10%. The company has before it the options of adopting a pay-out of 20% or 40% or 80%. Using Walter's formula, compute the market value of the company's share if the productivity of retained earnings is (*i*) 20%, (*ii*) 10%, or (*iii*) 8%.

Solution :

Walter's Formula:

$$P = \frac{D}{k_e} + \frac{(r/k_e)(E-D)}{k_e}$$

Dividend Payout ratio	Dividend per share (₹)
20%	20% of ₹ 10 = 2
40%	40% of ₹ 10 = 4
80%	80% of ₹ 10 = 8

Market Price per share if the Productivity of retained earnings (r) is

(*i*) **at 20%**	(*ii*) **at 10%**	(*iii*) **at 8%**
(*a*) 20% Payout ratio = ₹ 180	(*a*) 20% Payout ratio = ₹ 100	(*a*) 20% Payout ratio = ₹ 84
(*b*) 40% Payout ratio = ₹ 160	(*b*) 40% Payout ratio = ₹ 100	(*b*) 40% Payout ratio = ₹ 88
(*c*) 80% Payout ratio = ₹ 120	(*c*) 80% Payout ratio = ₹ 100	(*c*) 80% Payout ratio = ₹ 96

Illustration 10.4

Determine the market value of equity shares of the company from the following information:

Earnings of the company	₹ 5,00,000
Dividend paid	3,00,000
Number of shares outstanding	1,00,000
Price-earning ratio	8
Rate of return on investment	15%

Are you satisfied with the current dividend policy of the firm? If not, what should be the optimal dividend payout ratio? Use Walter's Model. *[B. Com. (H.), D.U. 2011]*

Solution :

$$\text{Price Earnings Ratio} = \frac{\text{Market Price}}{\text{EPS}}$$

$$8 = \frac{\text{Market Price}}{5}$$

So, Market price $= 8 \times 5$ = ₹ 40

$$EPS = \frac{5,00,000}{1,00,000} = ₹ 5$$

$$DPS = \frac{3,00,000}{1,00,000} = ₹ 3$$

$$\text{Dividend payout ratio} = \frac{DPS}{EPS} \times 100 = \frac{3}{5} \times 100 = 60\%$$

Walter's Model: As the P/E ratio is given 8, and the k_e, is also defined as the reciprocal of P/E ratio, therefore, the k_e may be taken as $1/8 = .125$.

Since, this is a growth firm having rate of return (15%) > cost of capital of 12.5%, therefore, the company will maximize its market price if it retains 100% of profits. The current market price of ₹ 40 (based on P/E ratio can be increased by reducing the payout ratio. If the company opts for 100% retention (*i.e.*, 0% payout), the market price of the share as per Walter's formula would be as follows :

$$P = \frac{D}{k_e} + \frac{(r/k_e)(E-D)}{k_e}$$

$$P = \frac{0}{.125} + \frac{(.15/.125)(5)}{.125} = ₹ 48$$

So, the firm can increase the market price of the share up to ₹ 48 by increasing the retention ratio to 100% or in other words, the optimal dividend payout for the firm is 0.

Illustration 10.5

The earnings per share (EPS) of a company is ₹ 10. It has an internal rate of return of 15% and the capitalisation rate of its risk class is 12.5%. If Walter's Model is used—

(*i*) What should be the optimum payout ratio of the company ?

(*ii*) What would be the price of the share at this payout ?

(*iii*) How shall the price of the share be affected, if a different payout were employed ?

Solution :

Walter's Model to determine share value :

$$\text{Market Price per share} = P_0 = \frac{D_1}{k_e} + \frac{r/k\,(E-D)}{k_e}$$

where, D = Dividend per share, E = Earning per share, r = Return on Investment and k_e = Capitalization rate

If $r > k_e$, the value of the share will increase as retention increases. The price of the share would be maximum when

the firm retains all the earnings. Thus, the optimum payout ratio in this case is zero. When the optimum payment is zero, the price of the share is :

$$P = \frac{0 + (0.15/0.125)(10 - 0)}{0.125} = \frac{12}{0.125} = ₹ 96$$

If the firm chooses a payout other than zero, the price of the share will fall. Suppose, the firm has a payment of 20%, the price of the share will be :

$$P = \frac{2 + (0.15/0.125)(10 - 2)}{0.125} = \frac{11.60}{0.125} = ₹ 92.80$$

Illustration 10.6

ABC and Co. has been following a dividend policy which can maximize the market value of the firm as per Walter's model. Accordingly, each year, at dividend time the capital budget is reviewed in conjunction with the earnings for the periods and alternative investment opportunities for the shareholders.

In the current year, the firm expects earnings of ₹ 5,00,000. It is estimated that the firm can earn ₹ 1,00,000 if the profits are retained. The investors have alternative investment opportunities that will yield them 10% return. The firm has 50,000 shares outstanding. What should be the dividend payout ratio in order to maximize the wealth of the shareholders ? Also find out the current market price of the share.

Solution :

The firm is expecting to earn an income of ₹ 1,00,000 on the investment of the profits of current year *i.e.*, ₹ 5,00,000. So, the rate of return, r, is 20% (*i.e.*, 1,00,000/5,00,000). The opportunity cost of the shareholders is given at 10%. It means that the rate of return of the firm, r, is more than the opportunity cost of capital, k_e.

The earnings per share of the firm is ₹ 10 (*i.e.*, ₹ 5,00,000/ 50,000). Since, $r > k_e$, the optimal D/P ratio, in order to maximize the wealth of the shareholder, is that the firm need not distribute any dividend. If no dividend is distributed by the firm, then, as per Walter's model, the market price of the share is :

$$P = \frac{D}{k_e} + \frac{(r/k_e)(E-D)}{k_e}$$

$$= \frac{0}{.10} + \frac{(.20/.10)(10-0)}{.10} = ₹ 200$$

Illustration 10.7

From the following information supplied to you, ascertain whether the firm is following an optimal dividend policy as per Walter's Model ?

Total Earnings	₹ 2,00,000
Number of equity shares (of ₹ 100 each)	20,000
Dividend paid	1,50,000
Price/Earning ratio	12.5

The firm is expected to maintain its rate of return on fresh investment. Also find out what should be the P/E ratio at which the dividend policy will have no effect on the value of the share? *[B. Com.(H.), D.U., 2017]*

Solution :

The EPS of the firm is ₹ 10 (*i.e.*, ₹ 2,00,000/20,000). The P/E Ratio is given at 12.5 and the cost of capital, k_e, may be taken at the inverse of P/E ratio. Therefore, k_e is 8 (*i.e.*, 1/12.5). The firm is distributing total dividends of ₹ 1,50,000 among 20,000 shares, giving a dividend per share of ₹ 7.50. The value of the share as per Walter's model may be found as follows :

$$P = \frac{D}{k_e} + \frac{(r/k_e)(E-D)}{k_e}$$

$$= \frac{7.50}{.08} + \frac{(.10/.08)(10 - 7.5)}{.08} = ₹ 132.81$$

The firm has a dividend payout of 75% (*i.e.*, ₹ 1,50,000) out of total earnings of ₹ 2,00,000. Since, the rate of return of the firm, r, is 10% and it is more than the k_e, of 8%, therefore, by distributing 75% of earnings, the firm is not following an optimal dividend policy.

In this case, the optimal dividend policy for the firm would be to pay zero dividend and in such a situation, the market price would be :

$$P = \frac{D}{k_e} + \frac{(r/k_e)(E-D)}{k_e}$$

$$= \frac{0}{.08} + \frac{(.10/.8)(10 - 0)}{.08} = ₹ 156.25$$

So, the market price of the share can be increased by following a zero payout.

The P/E ratio at which the dividend policy will have no effect on the value of the firm is such at which the k_e would be equal to the rate of return, r, of the firm. The k_e, would be 10% (= r) at the P/E ratio of 10. Therefore, at the P/E ratio of 10, the dividend policy would have no effect on the value of the firm.

Illustration 10.8

ABC Ltd. was started a year ago with a paid-up equity capital of ₹ 40,00,000. The other details are as under:

Earnings of the company	:	₹ 4,00,000
Dividend paid	:	₹ 3,20,000
Price-earnings ratio	:	12.5
Number of shares	:	40,000

(*i*) Find the company's dividend payout ratio. Find the market price of a share of the company at this payout ratio, using Walter's model.

(*ii*) Is the company's dividend payout ratio optimal as per the Walter's model? Why?

(*iii*) What is the market price of a share of the company at the 'optimal dividend payout' ratio as per the Walter's model? *[B.Com. (H.) D.U., 2010]*

Solution :

$$\text{Dividend Payout Ratio} = \frac{\text{Dividend}}{\text{Earnings}} = \frac{3,20,000}{4,00,000}$$

$$= 80\%$$

Market price as per Walter's Model :

$$r = 4,00,000/40,00,000 = 10\%$$
$$k_e = 1/PE\ Ratio = 1/12.5 = .08\ or\ 8\%$$
$$E = 4,00,000 \div 40,000 = ₹\ 10$$
$$D = 3,20,000 \div 40,000 = ₹\ 8$$
$$P = \frac{D}{k_e} + \frac{\frac{r}{k_e}(E-D)}{k_e}$$
$$= \frac{8}{.08} + \frac{\frac{.10}{.08}(10-8)}{.08} = ₹\ 131.25$$

ABC Ltd. has 'r' of 10% and 'k_e' of 8%. The Walter's Model suggests that when $r > k_e$, the company should distribute lesser and lesser dividends to maximise the MP. So, the company is not following optimal policy. The optimal policy for the company would be to distribute no dividend. In this case, the MP of the share would be:

$$P = \frac{8}{.08} + \frac{\frac{.10}{.08}(10-0)}{.08} = ₹\ 156.25$$

Illustration 10.9

A company has total investment of ₹ 5,00,000 assets and 50,000 outstanding equity shares of ₹ 10 each. It earns a rate of 15% on its investments, and has a policy of retaining 50% of the earnings. If the appropriate discount rate for the firm is 10%, determine the price of its share using Gordon Model. What shall happen to the price, if the company has a payout of 80% or 20% ?

Solution :

The Gordon' share valuation model is as under :

$$P_0 = \frac{(EPS)\ (1-b)}{k_e - br}$$

where b = Retention ratio = .50 or .20 or .80
k_e = discount rate = .10
r = rate of return = .15
EPS = $.15 \times 10 = ₹\ 1.50$

At a payment of 50%, the price of the share is :

$$P_0 = \frac{(1-0.5)\ 0.15 \times 10}{0.10 - 0.15 \times 0.5} = \frac{0.75}{0.025} = ₹\ 30$$

At a payment of 80 %, the price of the share is :

$$P_0 = \frac{(1-0.2)\ 0.15 \times 10}{0.10 - 0.15 \times 0.2} = \frac{1.20}{0.07} = ₹\ 17.14$$

When the payment is 20 %, the price of the share is :

$$P_0 = \frac{(1-0.8)\ 0.15 \times 10}{0.10 - 0.15 \times 0.8} = \frac{0.30}{-0.02} = -₹\ 15$$

In the last case, the share price is negative which is unrealistic.

Illustration 10.10

Assuming that rate of return expected by investor is 11% ; internal rate of return is 12% ; and earnings per share is ₹ 15, calculate price per share by 'Gordon Approach' method if dividend payout ratio is 10% and 30%.

Solution :

MP as per Gordons Approach, $P_0 = \frac{E(1-b)}{k_e - br}$

In the given case, $k_e = 11\%$
$r = 12\%$
$EPS = ₹\ 15$

If Dividend Payout is 10%, then retention ratio, b, is 90%.

$$P_0 = \frac{15(1-.9)}{.11 - .12 \times .9} = \frac{1.5}{.002} = ₹\ 750$$

If Dividend Payout is 30%, then retention ratio, b is 70%.

$$P_0 = \frac{15(1-.7)}{.11 - .12 \times .7} = \frac{4.5}{.026} = ₹\ 173.08$$

Illustration 10.11

RST Ltd. has a capital of ₹ 10,00,000 in equity shares of ₹ 100 each. The shares are currently quoted at par. The company proposes to declare a dividend of ₹ 10 per share at the end of the current financial year. The capitalization rate for the risk class to which the company belongs is 12%.What will be the market price of the share at the end of the year, if

(*i*) A dividend is not declared?

(*ii*) A dividend is declared?

(*iii*) Assuming that the company pays the dividend and has net profits of ₹ 5,00,000 and makes new investments of ₹ 10,00,000 during the period, how many new shares must be issued? Use the MM Model.

Solution :

Under MM Model, the current market price of equity shares is

$$P_0 = \frac{1}{1+k_e} \times (D_1 + P_1)$$

(*i*) **If the dividends is not declared :**

$$100 = \frac{1}{1+.12} \times (0 + P_1)$$
$$100 = \frac{P_1}{1.12}$$
$$P_1 = ₹\ 112$$

The market price of the equity share at the end of the year would be ₹ 112.

(*ii*) **If the dividend is declared :**

$$100 = \frac{1}{1+0.12} \times (10 + P_1)$$
$$100 = \frac{10 + P_1}{1.12}$$
$$112 = 10 + P_1$$
$$P_1 = 112 - 10 = ₹\ 102$$

The market price of the equity share at the end of the year would be ₹ 102.

(*iii*) In case the firm pays dividends of ₹ 10 per share out of total profits of ₹ 5,00,000 and plans to make new investment of ₹ 10,00,000, the number of shares to be issued may be found as follows :

Total Earnings	₹ 5,00,000
–Dividends paid	1,00,000
Retained earnings	4,00,000
Total funds required	10,00,000
Fresh funds to be raised	6,00,000
Market price of the share	102
Number of shares to be issued (₹ 6,00,000/102)	5,882.35

or, the firm should issue 5,883 new shares @ ₹ 102 per share to finance its investment proposals.

Illustration 10.12

Textrol Ltd. has 80,000 shares outstanding. The current market price of these shares is ₹ 15 each. The Company expect a net profit of ₹ 2,40,000 during the year and it belongs to a risk-class for which the appropriate capitalization rate has been estimated to be 20%. The Company is considering dividend of ₹ 2 per share for the current year.

(*a*) What will be the price of the share at the end of the year (*i*) if the dividend is paid and (*ii*) if the dividend is not paid?

(*b*) How many new shares must the Co. issue if the dividend is paid and the Co. needs ₹ 5,60,000 for an approved investment expenditure during the year? Use MM Model for the calculation.

Solution :

As per MM Model, the current market price of the share, P_0, is :

$$P_0 = \frac{1}{1 + k_e}(D_1 + P_1)$$

So, if the firm pays a dividend of ₹ 2, the price at the end of year 1, P_1, is :

$$15 = \frac{1}{1 + .20}(2 + P_1)$$

$$15 = \frac{1}{1.20}(2 + P_1)$$

$$P_1 = ₹\ 16$$

If the dividend is not paid, the price would be :

$$P_0 = \frac{1}{1 + k_e}(D_1 + P_1)$$

$$15 = \frac{1}{1 + .20}(0 + P_1)$$

$$P_1 = ₹\ 18$$

No. of new share, m, to be issued if the company pays a dividend of ₹ 2 :

$$mP_1 = I - (E - nD_1)$$
$$m \times 16 = 5,60,000 - [2,40,000 - (80,000 \times 2)]$$
$$m \times 16 = 5,60,000 - 80,000$$
$$m = 4,80,000/16 = 30,000 \text{ new shares.}$$

So, the company should issue 30,000 new shares at the rate of ₹ 16 per share in order to finance its investment proposals.

Illustration 10.13

Bestbuy Auto Ltd. has outstanding 1,20,000 shares selling at ₹ 20 per share. The company hopes to make a net income of ₹ 3,50,000 during the year ended 31st March 2014. The company is, considering to pay a dividend of ₹ 2 per share at the end of current year. The capitalisation rate for risk class of this company has been estimated to be 15%. Assuming no taxes, answer the questions listed below on the basis of the Modigliani Miller Dividend Valuation Model :

(*i*) What will be the price of a share at the end of 31st March, 2014, if (*a*) the dividend is paid ; and (*b*) if the dividend is not paid ?

(*ii*) How many new shares must the company issue if the dividend is paid and company needs ₹ 7,40,000 for an approved investment expenditure during the year?

[*B.Com. (H.), D.U., 2014*]

Solution :

As per MM Model, the price of the share (if the dividend is paid) :

$$P_0 = \frac{D_1 + P_1}{(1 + k_e)}$$

$$20 = \frac{2 + P_1}{(1 + 0.15)}$$

$$P_1 = 23 - 2 = ₹\ 21$$

As per MM Model, the Price of the share (if the dividend is not paid):

$$20 = \frac{0 + P_1}{(1 + 0.15)}$$

$$P_1 = 20(1.15)$$

$$P_1 = ₹\ 23$$

The number of new equity shares can be found as follows:

$$m = [I - (NP - nd_1)] \div P_1$$

$$= \frac{₹\ 7,40,000 - (₹\ 3,50,000 - 1,20,000 \times ₹\ 2)}{₹\ 22}$$

$$= \frac{₹\ 6,30,000}{₹\ 21} = 30,000 \text{ shares}$$

Thus, 30,000 shares will have to be issued to meet the investment needs of the company.

Illustration 10.14

Diamond Engineering Company has 10,00,000 equity shares outstanding at the start of the accounting year. The ruling market price per share is ₹ 150. The Board of Directors of the Company contemplates declaring ₹ 8 share as dividend at the end of the current year. The rate of Capitalization appropriate to the risk-class to which the company belongs is 12%.

(*a*) Based on Modigliani-Miller Approach, calculate the market price per share of the company when the contemplated dividend is (*i*) declared and (*ii*) not declared.

(*b*) How many new shares are to be issued by the company at the end of the accounting year on the assumption that the Net Income for the year is ₹ 2 crores ? Investment budget is ₹ 4 crores and (*i*) the above dividends are distributed and (*ii*) they are not distributed.

(*c*) Show that the total market value of the shares at the end of the accounting year will remain the same whether dividends are either distributed or not distributed. Also find out the current market value of the firm under both situations. [*B.Com. (H.), D.U., 2006, 2009*]

Solution :

(*a*) Existing market price share, P_0, = ₹ 150
Contemplated DPS, D_1, = ₹ 8
Rate of Capitalization, k_e, = 0.12
Market price as per MM approach is

$$P_0 = \frac{D_1 + P_1}{1 + k_e}$$

(*i*) **If contemplated dividends are declared, then**

$$₹\,150 = \frac{8 + P_1}{1 + .12}$$

or, P_1 = ₹ 160

(*ii*) **If dividends are not declared, then**

$$₹\,150 = \frac{0 + P_1}{1.12}$$

or, P_1 = ₹ 168

(*b*) **Calculation of number of shares to be issued :**

(₹ in '00'000)

	Dividends Distributed	**Dividends not Distributed**
Net Income	200	200
Total Dividends	80	—
Retained Earnings	120	200
Investment Budget	400	400
Amount to be raised by new issues	280	200
Relevant Market Price (₹ per share)	160	168
No. of new shares to be issued	1,75,000	1,19,050

(*c*) **Total number of shares at the end of the year**

Existing shares	10,00,000	10,00,000
+New shares issued	1,75,000	1,19,048
	11,75,000	11,19,048
Market price per share (₹)	160	168
Market value of share	11,75,000×160	11,19,048×168
	= 18,80,00,000	=18,80,00,064

Thus, the total market value of shares remains almost unaltered whether dividends are distributed or not distributed at all.

The current market value of the firm, nP_0, under both the conditions of dividend may be found with the help of Equation 17.5 as follows :

(*a*) **If dividend of ₹ 8 is paid :**

$$nP_0 = \frac{1}{(1 + k_e)} \times [nD_1 + (n + m)P_1 - (1 - E + nD_1)]$$

$$= \frac{1}{(1 + k_e)} \times [(n + m)P_1 - I + E]$$

$$= \frac{1}{(1 + .12)} \times [(11,75,000)160 - 4,00,00,000 + 2,00,00,000]$$

$$= ₹\,15,00,00,000$$

(*b*) **If dividend of ₹ 8 is not paid :**

$$nP_0 = \frac{1}{(1 + k_e)} \times [nD_1 + (n + m)P_1 - (I - E + nD_1)]$$

$$= \frac{1}{(1 + k_e)} \times [(n + m)P_1 - I + E]$$

$$= \frac{1}{(1+.12)} \times [(11,19,048)168 - 4,00,00,000 + 2,00,00,000]$$

$$= ₹\,15,00,00,057$$

So, the current market value of the firm is also almost same whether the dividend of ₹ 8 is paid by the firm or not at the end of current year.

Illustration 10.15

A company belongs to a risk-class for which the appropriate capitalization rate is 10%. It currently has outstanding 25,000 shares selling at ₹ 100 each. The firm is contemplating the declaration of dividend of ₹ 5 per share at the end of the current financial year. The company expects to have a net income of ₹ 2.5 lacs and a proposal for making new investments of ₹ 5 lacs.

Show that under the MM assumptions, the payment of dividend does not affect the value of the firm.

[B. Com. (H.), D.U. 2011, 2018]

Solution :

(*a*) Existing market price share, P_0, = ₹ 100
Contemplated DPS, D_1, = ₹ 5
Rate of Capitalization, k_e, = .10
Market price as per MM approach is

$$P_0 = \frac{D_1 + P_1}{1 + k_e}$$

(*i*) If contemplated dividends are declared, then

$$₹\,100 = \frac{5 + P_1}{1 + .10}$$

or, P_1 = ₹ 105

(*ii*) If dividends are not declared, then

$$₹\,100 = \frac{0 + P_1}{1 + .10}$$

or, P_1 = ₹ 110

(*b*) **Calculation of number of shares to be issued:**

	Dividends Distributed ₹	Dividends not Distributed ₹
Net Income	2,50,000	2,50,000
Total Dividends	1,25,000	—
Retained Earnings	1,25,000	2,50,000
Investment Budget	5,00,000	5,00,000
Amount to be raised by new issues	3,75,000	2,50,000
Relevant Market Price (₹ per share)	105	110
No. of new shares to be issued	3,571.4	2,272.7

(*c*) **Total number of shares at the end of the year :**

Existing shares	25,000.00	25,000.0
+New shares issued	3,571.4	2,272.7
Total shares	28,571.4	27,272.7
Market price per share (₹)	105	110
Market value of share	28,571.4 × 105 =30,00,000	27,272.7 × 110 =30,00,000

Thus, the total market value of shares remains unaffected whether dividends are distributed or not distributed at all. It may be noted that the number of the new shares to be issued have been taken exact at 3,571.4 and 2,272.4. But the shares cannot be issued in fractions. If the number of new shares to be issued is taken at integer values of 3,572 and 2,273 respectively, then the total market value of the firm would be ₹30,00,060 (*i.e.*, 28,572×105) and ₹30,00,030 (*i.e.*, 27,273×110), which are almost same.

OBJECTIVE TYPE QUESTIONS

State whether each of the following statements is ***True (T)*** *or* ***False (F)****.*

(*i*) Dividend is a part of retained earnings

(*ii*) Dividend is compulsorily payable to preference shareholders.

(*iii*) Effective dividend policy is an important tool to achieve the goal of wealth maximization.

(*iv*) Retained earnings is an easily available source of funds at no explicit cost.

(*v*) Dividend payout ratio refers to that portion of total earnings which is distributed among shareholders.

(*vi*) % rate of dividend is also known as dividend payout ratio.

(*vii*) There is a difference of opinion on relationship between dividend payment and value of the firm.

(*viii*) Walters model supports the view that dividend is relevant for value of the firm.

(*ix*) Gordon's model suggests that dividend payment does not affect the market price of the share.

(*x*) In the Walters model, the DP ratio should depend upon the relationship between r and k_e.

(*xi*) Residual theory says that dividend decision is no decision.

(*xii*) MM model deals with irrelevance of dividend decision.

(*xiii*) MM model is a fool proof model of dividend irrelevance.

(*xiv*) In the arbitrage process of MM model, the dividends paid by a company are replaced by fresh investment.

(*xv*) MM model asserts that value of the firm is not affected whether the firm pays dividend or not.

[**Answers :** *(i) F, (ii) F, (iii) T, (iv) T, (v) T, (vi) F, (vii) T, (viii) T, (ix) F, (x) T, (xi) T, (xii) T, (xiii) F, (xiv)T, (xv) T.*]

MULTIPLE CHOICE QUESTIONS

1. Walter's Model suggests for 100% DP Ratio when :
- (*a*) $k_e = r$
- (*b*) $k_e < r$
- (*c*) $k_e > r$
- (*d*) $k_e = 0$

2. If a firm has $k_e < r$, the Walter's Model suggests for :
- (*a*) 0% Payout
- (*b*) 100% Payout
- (*c*) 50% Payout
- (*d*) 25% Payout

3. Walter's Model suggests that a firm can always increase the value of the share by :
- (*a*) Increasing Dividend
- (*b*) Decreasing Dividend
- (*c*) Constant Dividend
- (*d*) None of the above

4. 'Bird in hand' argument is given by :
- (*a*) Walter's Model
- (*b*) Gordon's Model
- (*c*) MM Model
- (*d*) Residuals Theory

5. Residuals Theory argues that dividend is a :
- (*a*) Relevant Decision
- (*b*) Active Decision
- (*c*) Passive Decision
- (*d*) Irrelevant Decision

6. Dividend irrelevance argument of MM Model is based on :
   (*a*) Issue of Debentures
   (*b*) Issue of Bonus Share
   (*c*) Arbitrage
   (*d*) Hedging
7. Which of the following is not true for MM Model?
   (*a*) Share price goes up if dividend is paid
   (*b*) Share price goes down if dividend is not paid
   (*c*) Market value is unaffected by Dividend policy
   (*d*) All of the above.
8. Which of the following stresses on investor's preference for current dividend than higher future capital gains ?
   (*a*) Walter's Model
   (*b*) Residuals Theory
   (*c*) Gordon's Model
   (*d*) MM Model.
9. MM Model of Dividend irrelevance uses arbitrage between :
   (*a*) Dividend and Bonus
   (*b*) Dividend and Capital Issue
   (*c*) Profit and Investment
   (*d*) None of the above
10. If $k_e = r$, then under Walter's Model, which of the following is irrelevant?
   (*a*) Earnings per share
   (*b*) Dividend per share
   (*c*) DP Ratio
   (*d*) None of the above
11. MM Model argues that dividend is irrelevant as
   (*a*) the value of the firm depends upon earning power
   (*b*) the investors buy shares for capital gain
   (*c*) dividend is payable after deciding the retained earnings
   (*d*) dividend is a small amount
12. Which of the following represents passive dividend policy ?
   (*a*) that dividend is paid as a % of EPS
   (*b*) that dividend is paid as a constant amount
   (*c*) that dividend is paid after retaining profits for reinvestment
   (*d*) all of the above
13. In case of Gordon's Model, the MP for zero payout is zero. It means that :
   (*a*) Shares are not traded
   (*b*) Shares available free of cost
   (*c*) Investors are not ready to offer any price
   (*d*) None of the above
14. Gordon's Model of dividend relevance is same as :
   (*a*) No-growth Model of equity valuation
   (*b*) Constant growth Model of equity valuation
   (*c*) Price-Earning Ratio
   (*d*) Inverse of Price Earnings Ratio
15. If 'r' = 'ke', than MP by Walter's Model and Gordon's Model for different payout ratios would be :
   (*a*) Unequal
   (*b*) Zero
   (*c*) Equal
   (*d*) Negative

[**Answers :** *1(c), 2(a), 3(d), 4(b), 5(c), 6(c), 7(c), 8(c), 9(b), 10(c), 11(a), 12(c), 13(c), 14(b), 15(c)*].

ASSIGNMENTS

1. Write short notes on :
   — Walter's Approach to dividend policy.
   — Gordon's Approach to relevance of dividend decision.
2. How far do you agree with the proposition that dividends are relevant ?
3. How far do you agree with the proposition that dividends are irrelevant ?
4. What are the essentials of Walter's dividend model ? Explain its shortcomings ?
5. What are the assumptions which underline Gordon's model of dividend effect ? Does dividend policy affect the value of the firm under Gordon's model ?
6. "The contention that dividends have an impact on the share price has been characterized as the bird-in-hand argument." Explain the essentials of this argument.
7. "The assumptions underlying the irrelevance hypothesis of Modigliani and Miller are unrealistic." Explain.
8. Explain the Modigliani-Miller hypothesis of dividend irrelevance. Does this hypothesis suffer from deficiencies ?
   [B.Com. (H.), D.U., 2018]
9. Explain the arbitrage process used by the Modigliani-Miller hypothesis in support of the argument for irrelevance of dividend.
10. It is well documented that share prices tend to rise when firms announce an increase in their dividend payouts. How then can it be said that dividend policy is irrelevant?
11. "In a world of no taxes and no transaction costs, a firm cannot be made more valuable by manipulating the

dividend payout ratio." Examine the validity of the statement.

12. The key argument of Walter's Model is that a firm would have an optimum dividend policy. Comment and explain taking illustration. *[B.Com.(H.), D.U., 2012]*

13. How does Gordon's Model differ from Walter's Model to relevance of dividends ? What are their similarities? *[B.Com.(H.), D.U., 2014, 2016]*

14. Explain the Gordon's Model of relevance of dividend. *[B.Com.(H.), D.U., 2017]*

PROBLEMS

P10.1 The earnings per share of a company are ₹ 10. It has rate of return of 15% and the capitalization rate of risk class is 12.5%. If Walter's model is used : (*i*) What should be the optimum payout ratio of the firm ? (*ii*) What would be the price of the share at this payout ? (*iii*) How shall the price of the share be affected if a different payout was employed?

[*Answer :* As $r > k_e$, the optimal payout ratio is zero. The price of the share would be ₹ 96.]

P10.2 The earnings per share of a Company are ₹ 8 and the rate of capitalization applicable to the company is 10%. The company has before it an option of adopting a payout ratio of 25% or 50% or 75%. Using Walter's formula of dividend payout compute the market value of the company's share if the productivity of retained earnings is (*i*) 15%, (*ii*) 10%, and (*iii*) 5%.

[*Answer :* The price at r = 10% would be ₹ 80 in all cases of payout. At r = 15%, the price would be ₹ 110, ₹ 100 and ₹ 90 respectively. At r = 5%, the price would be ₹ 50, ₹ 60 and ₹ 70 respectively.]

P10.3 A company has a total investment of ₹ 5,00,000 in assets, and 50,000 outstanding common shares at ₹ 10 per shares (par value). It earns a rate of 15% on its investment, and has a policy of retaining 50% of the earnings. If the appropriate discount rate of the firm is 10 per cent, determine the price of its share using Gordon's model. What shall happen to the price of the share if the company has payout of 80 per cent or 20 per cent ?

[*Answer :* Price as per Gordon's model, at 50% payout is ₹ 30; at 80% payout is ₹ 17; and at 20% payout is ₹ –15 (which is absurdity).]

P10.4 The earnings per share of a company are ₹ 16. The market rate of discount applicable to the company is 12.5%. Retained earnings can be employed to yield a return of 10%. The company is considering a payout of 25%, 50% and 75%. Which of these would maximize the wealth of shareholders.

[*Answer :* 75% payout.]

P10.5 Calculate the market price of a share of ABC Ltd. under (*i*) Walter's formula; and

(*ii*) dividend growth model from the following data :

Earnings per share	₹ 5
Dividend per share	₹ 3
Cost of capital	16%
Internal rate of return on investment	20%
Retention ratio	40%

[*Answer:* (*i*) ₹34.38; (*ii*) ₹37.50.]

P10.6 The Agro-Chemicals Company belongs to a risk class for which the appropriate capitalization rate is 10%. It currently has 1,00,000 shares selling at ₹ 100 each. The firm is contemplating the declaration of ₹ 5 as dividend at the end of the current financial year, which has just begun. What will be the price of the share at the end of the year, if a dividend is not declared ? What will it be if it is ? Answer these on the basis of Modigliani and Miller model and assume no taxes.

[*Answer :* ₹ 110 and ₹ 105.]

P10.7 XYZ Ltd. had 50,000 equity shares of ₹ 10 each outstanding on January 1. The shares are currently being quoted at par in the market. The company now intends to pay a dividend of ₹ 2 per share for the current calendar year. It belongs to a risk-class whose appropriate capitalization rate is 15%. Using Modigliani-Miller and assuming no taxes, ascertain the price of the company's share as it is likely to prevail at the end of the year (*i*) when dividend is declared, and (*ii*) when no dividend is declared. Also find out the number of new equity shares that the company must issue to meet its investment needs of ₹ 2 lacs, assuming a net income of ₹ 1.1 lacs and also assuming that the dividend is paid.

[*Answer :* Price at the end of the current year would be ₹ 9.50 and ₹ 11.50 respectively. New shares to be issued are 20,000.] *[B. Com.(H.), D.U., 2013]*

P10.8 The ABC Ltd., currently has outstanding 1,00,000 shares selling at ₹ 100 each. The firm is considering to declare a dividend of ₹ 5 per share at the end of the current fiscal year. The firm's opportunity cost of capital is 10%. What will be the price of the share at the end of the year if (*i*) a dividend is not declared, (*ii*) a dividend is declared ?

Assuming that the firm pays the dividend, has net profits of ₹ 10,00,000 and makes new investments of ₹ 20,00,000 during the period, how many new shares must be issued ? Use the MM model to answer these questions.

[*Answer :* Price at the end of the current year would be ₹ 110 and ₹ 105 respectively. New shares to be issued by the company are 14,285.] *[B.Com.(H.), D.U., 2012]*

P10.9 The present share capital of A Ltd. consist of 1,000 shares selling at ₹ 100 each. The company is contemplating a dividend of ₹ 10 per share at the end of the current financial year. The company belongs to a risk class for which appropriate capitalization rate is 20%.

The company expects to have a net income of ₹ 25,000. What will be the price of the share at the end of the year if (*i*) dividend is not declared, and (*ii*) a dividend declared. Presuming that the company pays the dividend and has to make new investment of ₹ 48,000 in the coming period, how new shares be issued to finance the investment program ? You are required to use the MM model for this purpose.

[*Answer :* The price of the share would be ₹ 120 and ₹ 110 respectively and the company is required to issue 300 new shares if dividend is paid.]

P10.10 A textile company belongs to a risk-class for which the appropriate PE ratio is 10. It currently has 50,000 outstanding shares selling at ₹ 100 each. The firm is contemplating the declaration of ₹ 8 dividend at the end of the current fiscal year which has just started. Given the assumption of MM, answer the following questions :

(*i*) What will be the price of the share at the end of the year: (*a*) if a dividend is not declared, (*b*) if it is declared ?

(*ii*) Assuming that the firm pays the dividend and has a net income of ₹ 5,00,000 and makes new investments of ₹ 10,00,000 during the period, how many new shares must be issued ?

(*iii*) What would be the current value of the firm : (*a*) if a dividend is declared, (*b*) if a dividend is not declared ?

[*Answer :* The price of the share would be ₹ 110 and ₹ 102 respectively. The company would be required to issue 9,00,000/102 new shares. The current market value of the firm would be ₹ 50,00,000 and the expected market value of the firm at the end of current year would be ₹ 60,00,000.]

[B. Com.(H.), D.U., 2016],
[B. Com.(H.), D.U., 2017, Adapted]

CHAPTER

11

Dividend Policy : Determinants and Constraints

*"The firm's financial manager must come to grip with the problem of allocating corporate earnings between dividend paid and earnings retained. Theoretically, so long as the firm can look forward to earnings a higher return on reinvested earnings than the shareholders would expects to earn by investing their dividends, long term shareholder's interest are better served by a low dividend payout policy. Also dividend payments may be limited by (*i*) legal restrictions, (*ii*) contractual restrictions, (*iii*) the firm's cash position, and (*iv*) other practical consideration."*[1]

SYNOPSIS

- Dividend Policy and Retained Earnings.
- Dividend Payout Ratio.
- Stability of Dividends.
  - Constant Dividend Payout Ratio.
  - Steady Dividend Per Share.
  - Steady Dividend Per Share Plus Extra.
- Legal and Procedural Constraints.
- Scrip Dividend or Bonus Shares.
- Informational Contents of Dividends.
- Graded Illustrations in Dividend Policy.

1. Kreps C.H., and Wacht R.F., *Financial Administration,* The Dryden Press, Illinois, First Edition, p. 249.

In the preceding chapter, the relationship between dividend policy and its effect on the value of the firm have been analyzed in view of the difference of opinion regarding the relationship. Various theoretical models (Walter's, Gordon's, MM, *etc.*) have been discussed and were found to be incapable of describing fully the relationship between the dividend policy and value of the firm. Nevertheless, dividend payment is an important consideration used by present as well as prospective shareholders in valuing the worth of the share. The management of a firm must therefore, have a dividend policy which helps in lowering its cost of capital and maximizing the market price of the share. A dividend policy may be defined as a guiding principle in determining what portion of earnings be paid out to shareholders as dividends. As firms differ from one another in more than one way, there cannot be an optimal dividend policy which can be adopted by all the firms in order to attain the objective of maximization of shareholders wealth.

A firms dividend policy includes two basic dimensions : (*i*) The dividend payout ratio, which indicate the amount of dividends distributed in relation to the earnings, and (*ii*) The stability of dividends which may be as important to any investor as the amount of dividend is. So, in the first instance, the financial manager has to decide as to how much profits be distributed, or to decide the dividend payout ratio (DP ratio). Moreover, in addition to DP ratio, a whole lot of other economic, legal and procedural constraints are also to be considered while framing a dividend policy for the firm. The present chapter attempts to discuss all these factors which have a bearing on the dividend policy of a firm.

Dividend Payout Ratio : The first and the foremost dimension of a dividend policy is the decision regarding the DP ratio *i.e.*, to decide about the percentage of profits to be distributed by the firm. The DP ratio is the ratio between dividends to equity shareholder and the profits after tax. In other words, it is the percentage of dividend distributed out of total profit after tax. It may be calculated as follows :

$$\text{DP Ratio} = \frac{\text{Dividend paid to Shareholders}}{\text{Net Profit after tax}}$$

For example, if out of the total profits after tax of ₹ 50,00,000, the firm distributes dividends amounting to ₹ 30,00,000. In this case, the DP ratio is 60% *i.e.*, ₹ 30,00,000/ ₹ 50,00,000. The profits which are not distributed are retained and available for financing the investment. So, the decision regarding the DP ratio is a critical decision and be taken after the perusal of the followings:

1. **Liquidity :** The dividend represents distribution of profits and payment of dividend results in decrease in cash. However, the profits need not necessarily assure the availability of liquid funds. A large amount of profit does not, in any way indicate that cash is available for payment of dividends. The firm's position in liquid cash is basically independent of the earnings. A company with sizable earnings may be generating cash from operations, but these funds are generally either re-invested in the firm itself or are used to pay for maturing the debts. A firm may be profitable but still a cash poor. Thus, the liquidity position of the firm is an important consideration while deciding the dividend payout.
2. **Growth Plans :** A firm having growth plans and profitable and viable investment opportunities, requires funds for financing of these. Such a firm will have a tendency to adopt a low DP ratio. This will ensure availability of more and more funds to the firm and that too at no apparent or explicit cost, as the retained earnings have no explicit cost. Moreover, if the firm does not have access to external financing (either in form of share capital or in form of borrowings), then the firm will have no options but to generate the resources internally by ploughing back the profits. This also requires a low payout ratio to be adopted by the firm. On the other hand, a firm having no immediate growth plans or investment opportunities, may adopt liberal or high DP ratio.
3. **Control :** As stated above, the dividend payout reduces the funds position and results in lower internal accruals. The firm may then have to raise funds externally. If the funds are to be raised by issuing equity share capital (either because of market conditions or because of debt-equity ratio considerations), then the issue of fresh equity share capital may result in dilution of management control. The present shareholders in general and the management of the firm in particular, may not favour higher DP ratio which may ultimately force the firm to raise the funds externally by issuing additional share capital.

Establishing a dividend policy is walking on a tight rope. On the one hand, paying too much in dividends create several problems : The firm may find itself short of funds for new investment and may have to incur the cost associated with new issues of securities or capital rationing. On the other hand, paying too little in dividends can also create problems. For one, the firm will find itself with a cash balance that increases over time, which can lead to investments in 'bad' projects, especially when the interest of the management in the firm are different from those of the shareholders. However, still a firm, while designing the dividend policy must attempt to answer two questions namely :

1. How much cash is available to be paid out as dividend after meeting capital expenditures and working capital requirements needed to sustain future growth ?
2. How good are the proposals that are available before the firm ? In general, the firms that have good proposal will have an easy time with dividend policy, since the shareholders will expect that the cash accumulated in the firm will be invested in these projects and eventually earn high returns. On the other hand, the firms that do not have good proposals may find themselves under pressure to payout all cash profits (of course subject to legal restrictions) to the shareholders.

Consequences of Low Payout : If a firm pays much less than what is available as cash profits, it may give rise to different consequences as follows :

(*a*) When a firm pays out less than it can afford, it accumulates cash. If a firm does not have good proposals (now or in future) to invest this cash, then it may face several possibilities. In the most benign case, such cash gets invested in financial assets.

(*b*) As the cash accumulates, the financial manager may be tempted to take on projects that do not meet the minimum rate of return requirements. These actions will clearly lower the value of the firm.

(*c*) Another possibility is that the management may decide to use the cash to finance an acquisition which may result in the transfer of wealth of the shareholders to the shareholders of the acquired firm.

However, the result of low payout may be more positive for firms that have a better selection of projects and whose management has a history of earning good returns for the shareholders. The long term effects of cash accumulations for such firms are generally positive for the following reasons :

(*i*) The presence of projects that earn returns greater than the hurdle rate increases the likelihood that the cash will be productively invested in the long run.

(*ii*) The high returns earned on internal projects reduces both the pressure and the incentive to invest to poor projects.

Consequences of High Payout: If a firm pays more than what is available as cash profits, it may give rise to different consequences as follows :

(*a*) When a firm pays out more in dividends than it has available as cash profits, it is creating a cash deficit which has to be funded by drawing on the firm's own cash balance or borrowing money or issuing securities.

(*b*) The cash that is paid out as dividends could have been used to invest in some of the good projects, leading to a much higher return and much higher price to the shareholders. So, it can be argued that the firm is paying a hefty price for its dividend policy. The cash this firm is paying out as dividend would earn better returns if it is left to accumulate and invested in the firm.

STABILITY OF DIVIDENDS

Another important dimension of a dividend policy is the stability of dividends that is how stable, regular or steady should the dividends stream be over time ? It is generally said that the shareholders favour stable dividends and those dividends which have prospects of steady upward growth. If a firm develops such a pattern of paying stable and steady dividends, then the investors/shareholders may be willing to pay a higher price for the shares.

So, while designing a dividend policy for the firm, it is also to be considered as to whether the firm will have a consistency in dividend payments or the dividends will fluctuate from one year to another. In the long run, every firm will like to have a consistent dividend policy, yet fluctuations from one year to another may be unavoidable. The dividend policy, from the point of view of stability may be classified as follows :

1. Constant DP Ratio : A firm may have a policy of distributing a fixed percentage of earnings as dividends to its shareholders. The higher profits will result in higher absolute dividends while lower earnings will result in lower absolute amount of dividends. For example, a firm having a DP ratio of 60% will distribute ₹ 6,00,000 as dividends if the profits are ₹ 10,00,000; and it will distribute ₹ 2,40,000 only if the profits are ₹ 4,00,000, and so on. Thus, the percentage dividend rate or dividend per share may fluctuate from year to year depending upon the earnings of the firm. The dividend per share will be a fixed percentage of the earning per share as depicted in Figure 11.1.

The Figure 11.1 shows that the amount of dividend per share increases or decreases in sympathy with the change in earnings per share. The constant DP ratio policy is not generally adopted by firms. Such a policy would result in widely fluctuating dividends. This will keep away those investors who prefer a steady income in the form of dividends. Further, if dividend income is taxable in the hand of the shareholder, then the tax liability will also fluctuate with every change in dividend income.

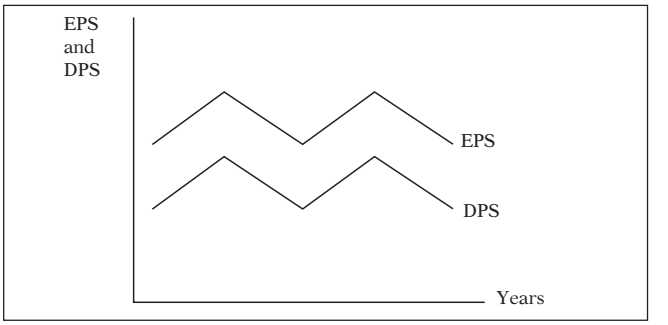

FIGURE 11.1: CONSTANT DIVIDEND-PAYOUT RATIO

2. Steady Dividend Per Share : Some firms may prefer to pay a steady and fixed dividend per share to the shareholders irrespective of the earnings. Under this policy, the firm pays a fixed amount per share as dividends to its shareholders. However, the earnings may fluctuate from year to year and so the firm has to be careful in setting the dividend amount at a reasonable level. The dividend per share once decided is maintained for few years. Thereafter, it may be reviewed for increase or decrease depending upon the expected earnings. The dividend per share is not increased or decreased for a temporary increase or decrease in earnings but only for maintainable increase or decrease. The steady dividend per share policy is quite popular and investors also favour this type of policy as it will enable them to plan their investments. The steady dividend per share policy has been depicted in Figure 11.2.

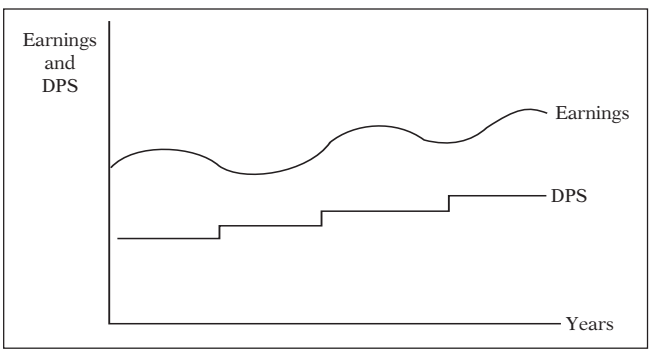

FIGURE 11.2 : STEADY DIVIDEND PER SHARE

3. Steady Dividends plus Extra : A firm may also adopt a policy of paying a steady dividends together with paying some extra whenever supported by the earnings of the firms. The extra dividend may be considered as a 'bonus' paid to the shareholders as a result of on usually good year for the firm. This extra may be paid in the form of cash or bonus shares, depending upon the firm's liquidity position. The designation 'extra' is used in connection with the payment to tell the shareholder that this is extra and may not be maintained in future.

From, the point of view of the management, a constant dividend per share together with an extra dividend when supported by higher earnings will be more flexible. In such a policy, the management will like to said the constant dividend per share lower than what it would have been otherwise. This policy does relate the dividend payment with the firm's ability to pay, since the extra or special dividend will be paid only if sufficient extra cash profits are generated by the operations.

Some companies have come out with a payment of a special dividend on a particular occasion *e.g.,* the silver jubilee year of the firm.

Relevance of Stability of Dividends : It is already stated that stability of dividend is an important dimension of the dividend policy. Firms which follow a stable dividend policy, command a better goodwill in the market and higher market price of the share. The stable dividend policy may be suggested in view of the following :

(*a*) Many individual investors are not interested in future capital gains, rather they want a regular dividend income from the firms. The regular and constant dividend help these investors to plan their expenditures or investment schedule and thus avoiding many of their hardships,

(*b*) Dividend in itself is an implied source of information about the present and expected profitability of the firm. The firm can convey lot of information about the prospects of the firm in the form of dividend announcement. A stable and continuous dividend conveys to the shareholder that the firm is in good health. An increase in dividend transmits improved prospects while a decrease in dividends implies a pressure on profitability. If the firm skips or lowers the dividend payment in a given period due to one or the other reason, the shareholders are quite likely to react unfavourably. The non-payment of dividend creates uncertainty which is likely to result in lower share values. Even if current earnings are lower, a firm should continue its dividend payments to avoid conveying negative information to the shareholders.

(*c*) Stable dividend policy also helps a firm in establishing itself in the capital market and raising required funds externally. Both the institutional and the individual investors prefer investing funds in a firm which has or is expected to have a stable dividend policy. Sometimes, the institutional investors may even regard a stable dividend policy as a precondition to approve fresh financial assistance in a firm.

Thus, the firm should attempt and develop a dividend policy that provides the shareholders and prospective investors with positive and correct information and thus reducing the uncertainty about the future of the firm. The firm should change its dividend policy only in response to those changes which are maintainable in future.

A stable dividend policy helps in (*i*) stabilizing the market value of the share, (*ii*) maintaining the firm's credit rating, (*iii*) creating the confidence of investors/shareholders in the firm. All these things tend not only to enlarge the number of potential investors but also enhance the shareholders loyalty to the firm and reduces the management's need for concern over the control of the firm.

LEGAL AND PROCEDURAL CONSIDERATIONS

While designing a dividend policy for a firm, the legal and statutory frame work should also be considered as the dividend policy is often constrained by legal and contractual factors. The legal factors result from laws while the contractual constraints may result from loan provisions. Even if other considerations *i.e.,* the DP ratio and the stability of dividend *etc.* are favouring a dividend payment, the firm must consider the legal provisions and considerations.

In India, several restrictions have been imposed on companies in respect of dividend payments. These provisions regarding quantum and procedure for payment of dividend are contained in Sections 123, 124, 126 and 127 of the Companies Act, 2013 and Articles 80-88 of the Table F of the Companies Act, 2013. These provisions may be summarized as follows :

1. A company can pay dividends to shareholders only if sufficient provision have been made for the redemption of preference shares, if any and also that sufficient depreciation has been, provided as per Schedule II annexed to the Companies Act, 2013.

2. All dividends must be paid in cash (with the exception of scrip dividends *i.e.,* bonus shares which is the capitalization of profits). The cash dividends may be paid either as

(*a*) ***Final dividend*** which is payable only after recommended by the Board of Directors and approved by the shareholders at the Annual General Meeting of the Company. There are certain procedural constraints and formalities in respect of payment of final dividend given in the bye-laws of the stock exchange where the shares are listed, or

(*b*) ***Interim dividend*** which is payable after passing a resolution by the Board of Directors and even before the finalization of accounts for that year. So, the interim dividend is paid in between two annual general meetings. The Board may pay such dividend only if it expects a sufficient profits for the period. A company can pay interim dividend only if authorized by the Articles of Associations of the Company.

3. Dividend is payable only out of current year revenue profits of the company. However, in certain cases, dividend can be paid out of accumulated profit also in case of inadequate or no current year profit. In this context, the following rules are worth noting :

The prescribed rules framed by the Central Government in this respect are known as the Companies (Declaration and Payment of Dividend) Rules, 2013. Rule 2 provides that in the

event of inadequacy or in the absence of profits in any year, dividend may be declared by a company for that year out of the accumulated profits earned by it in the previous years and transferred by it to the reserves, subject to the conditions that :

(*a*) the rate of dividend shall not exceed the average of the rates at which dividend was declared by it in the three years immediately preceding that year.

(*b*) the total amount to be drawn from the accumulated profits earned in previous years and transferred to the reserve shall not exceed an amount equal to one-tenth of the sum of its paid up capital and free reserves and the amount so drawn shall first be utilized to set off the losses in the financial year before any dividend in respect of preference or equity shares is declared; and

(*c*) the balance of reserves after such draw shall not fall below 15 per cent of its paid up capital.

For the purposes of the rules, profit earned by a company in previous years and transferred by it to the 'reserves' shall mean the total amount of net profits after tax, transferred to reserves as at the beginning of the year for which the dividend is to be declared; and in computing the said amount, the appropriations out of the amount transferred from the Development Rebate Reserve (at the expiry of the period specified under the Income Tax Act, 1961) shall be included and all items of capital reserves including reserves created by revaluation of assets shall be excluded.

4. The dividends, once declared at the annual general meeting of the company must be paid within 30 days of the declaration. If not, then within 7 days from the date of expiry of the said period of 30 days, the company must deposit the unpaid dividends to a separate bank account to be opened by the company in a Scheduled Bank, to be called "Unpaid Dividend Account of.....Ltd.". If the money remains unpaid/unclaimed in this account for a period of 7 years from the date of transfer, then such money shall be transferred by the company to the Investor Education and Protection Fund.

The most widely used method of distribution of earnings among the shareholders is to distribute by way of cash dividends. However, there are a number of other forms also of dividend payments. More common of these methods are the issue of bonus shares and repurchase of shares.

Scrip Dividend or Bonus Shares : It is already discussed that dividend payment is an important instrument through which the market price of the share and hence the wealth of the shareholders can be maximized. Dividend payment involves payment in cash and hence affects the liquidity position of the firm. There is another way of utilization of profits to reward the shareholders, without however, affecting the current liquidity position of the firm. This is known as scrip dividend or issue of bonus shares by capitalization of profits.

Bonus shares are the shares issued by a company free of costs by capitalization of its profits and reserves. The issue of bonus shares results in increase in number of shares and hence increases the paid up capital of the company without involving any monetary transaction. Such shares are issued to all the existing equity shareholders in proportion of their holding of the share capital of the company. Since, the number of shares increases as a result of bonus shares, the book value and the earnings per share of the company will decrease (other things remaining same).

The mechanism of the bonus share is simple. The firm first issues additional shares by passing a resolution and then distribute these shares among the existing shareholders in proportion to their holding. The bonus shares do not alter the proportional ownership of the firm as far as the existing shareholders are concerned. As the bonus issue does not affect the cash flows or the operational efficiencies of the firm, there should not be any change in the total value of the firm. The market price per share would decrease but the shareholders are no worse off after the bonus, notwithstanding such decrease, because they receive a compensatory increase in the number of shares held.

Reasons for Issue of Bonus Shares : If the effect on shareholders wealth is in fact neutral, why do firms issue bonus share. The announcement of the bonus issue conveys information to the capital market about the future prospects of the firm. In fact, the use of bonus shares as signal of bright future may increase the firm's value.

Companies have a common tendency to issue bonus shares to their shareholders. Many companies have issued bonus shares once a while, whereas some other companies have issued bonus shares on a regular basis. Companies such as Colgate-Palmolive Ltd., Bajaj Auto Ltd., Hindustan Lever Ltd., Ingersoll-Rand Ltd. have issued bonus shares on a regular basis. There are many companies whose 95% or more of the total paid up capital has been issued as bonus shares. The companies may prefer issue of bonus shares as against the payment of cash dividend for several reasons as follows :

1. When a company issues bonus shares, it utilizes a part of the profit of the company and also rewards the shareholders but without affecting the liquidity of the company. By issuing bonus shares, a company in fact shares the growth of the company with the shareholders who are rewarded not in terms of cash but in terms of capital receipt *i.e.*, bonus shares. Therefore, the company, on the one hand, is able to satisfy the expectations of the shareholders (to get returns on their investments), and also simultaneously on the other, is able to preserve the liquidity of the company.
2. The issue of bonus shares reduces the market price of the share. For example, if a company issues bonus shares in the ratio of 1:1, then the market price of the share after bonus issue will tend to be 50% of the market price before issue of such bonus shares. Thus, the company may be in a position to keep the market price of the share within the reach of the common investors. Bringing the price down increases the number of potential buyers for the shares, leading to a higher share price. Furthermore, there is control benefit of the share being more widely held.
3. Since, bonus shares is capital receipt, it is not taxable in the hands of the issuing company as well as the shareholders. In India, however, in case of dividends paid in cash, the paying company has to pay a dividend tax @ 10%, while the issue of bonus shares does not require any tax payment.

4. Issue of bonus shares increases the goodwill of the company in the capital market and build a confidence among the investors and thus helps raising additional funds in future. In fact, the issue of bonus shares is always taken and evaluated positively by the capital market.
5. Bonus Issue helps a company to streamline its capital structure and bring its paid up capital in line with the capital employed in the business.

The issue of bonus shares by companies in India is also regulated by legal provisions. Section 63 of the Companies Act, 2013 contains provisions relating to issue of bonus shares. The Securities and Exchange Board of India has issued the revised guidelines for issue of bonus shares in year 2009. The guidelines for the issue of bonus shares can be summarized as follows :

(*i*) These guidelines are applicable to existing listed companies who shall forward a certificate duly signed by the issuer and duly countersigned by its statutory auditor or by a company secretary in practice to the effect that the terms and conditions for issue of bonus shares as laid down in these guidelines have been complied with.

(*ii*) Issue of bonus shares after any public/rights issue is subject to the condition that no bonus issue shall be made which will dilute the value or right of the holders of debentures, convertible fully or partly. In other words, no company shall, pending conversion of FCDs/PCDs, issue any shares by way of bonus unless similar benefit is extended to the holders of such FCDs/PCDs, through reservation of shares in proportion to such convertible part of FCDs/or PCDs. The shares so reserved may be issued at the time of conversion(s) of such debentures on the same terms on which the bonus issues were made.

(*iii*) The bonus issue is made out of free reserves built out of the genuine profits or share premium collected in cash only.

(*iv*) Reserves created by revaluation of fixed assets are not capitalized.

(*v*) The declaration of bonus issue, in lieu of dividend, is not made.

(*vi*) The bonus issue is not made unless the partly-paid shares, if any existing, are made fully paid-up.

(*vii*) The company has not defaulted in payment of interest or principal in respect of fixed deposits and interest on existing debentures or principal on redemption thereof, and has sufficient reason to believe that it has not defaulted in respect of the payment of statutory dues of the employees such as contribution to provident fund, gratuity, bonus *etc.*

(*viii*) A company which announces its bonus issue after the approval of the Board of Directors must implement the proposals within a period of six months from the date of such approval and shall not have the option of changing the decision.

(*ix*) There should be a provision in the Articles of Association of the company for capitalization of reserves, *etc.*, and if not, the company shall pass a Resolution at its General Body Meeting making provisions in the Articles of Association for capitalization.

(*x*) Consequent to the issue of bonus shares if the subscribed and paid-up capital exceed the Authorized share capital, a Resolution shall be passed by the company at its General Body Meeting for increasing the Authorized capital.

Informational Contents of Dividends : The proponents of dividend irrelevance argue that a firms value is determined strictly by its investment and financing decisions and that the dividend policy has no impact on the value. However, in practice, an unexpected change in dividends may have a significant impact on the share price. It may be that the investors use a change in dividend policy as a signal about the firm's financial condition, especially its earnings position. Thus, a dividend increase that is larger than expected might signal to the investors that the management expects still higher earnings in the future. Conversely, a dividend decrease or lesser than expected dividends might signal that the management is forecasting less favourable future earning. The dividends may therefore be taken as an important communication tool. The management may have no other credible way to inform investors about future earning or at least, no convincing way that is less costly.

However, no matter what the decision area, how the market price response to managements action is not determined entirely by the action itself, but is also affected by the investor's expectation about the ultimate decisions to be made by the management. As the time approaches for management to announce the dividends, investors usually make expectations about these dividends. These expectations may be based on several factors such as past dividends, current earnings, investment strategies and financing decisions. The general economic conditions, the general expectations in the capital market and the Government policies may also be considered.

The actual dividends announced by the firm are compared by the investors with the expected dividends. If the dividend is as expected, the market price of the share may not show any variation. However, if the dividend is higher or lower than expected, the investors will reassess their perceptions about the firm. They may use the unexpected dividend decision as a clue about the unexpected changes in the earnings *i.e.*, the dividend change has an information content about the firms earnings. In case of difference between the actual and the expected dividends, the market price of the share may show significant variations depending upon the assessment of the situation by the shareholders.

Conclusion : A firm should consider all the determinants in deciding the dividend policy for the firm. It is probably difficult for a financial manager to reach a definite conclusion, nevertheless, he is left with no choice. A firm must develop a dividend policy which is based on the best available information. Firms have a variety of options available to them when it comes to distribution of profits to the shareholders. They can payout the profits as dividends, either regular or special; repurchase the share; or issue the bonus shares. Firms that wants to derive the maximum signalling benefit from the

dividend and whose shareholders like or are indifferent to cash dividend, will like to increase the regular dividends.

In case the investment opportunities of the firm increase, the dividend payout ratio should decrease. In other words, an inverse relationship exists between the amount of investment and the dividends distributed among the shareholders. As the flotation costs are associated with raising new fund, the retention of profits is cheaper and is generally preferred to selling new share. Firms that are unsure about their capacity to keep generating cash profit in future periods are more inclined to use special dividends, if their shareholders like dividends; or share repurchase, if they do not. Firms that do not have sufficient cash profit in the current period but believe in their capacity to generate higher profits in the future may use bonus share with the implicit understanding that they will be increasing dividends in future periods.

POINTS TO REMEMBER

- Dividend payment to shareholders is one of the few ways in which the firm can affect the market price of the share, and thereby can affect the wealth of the shareholders.
- The management of the firm must follow a dividend policy which helps maximising the wealth of the shareholders.
- Dividend policy may be defined as to determine what portion of profit be distributed among the shareholders and what portion should be retained.
- There are two basic dimensions of a dividend policy. These are Dividend-Payout Ratio (DP Ratio) and the Stability of Dividends.
- DP Ratio refers to the portion of profit to be distributed among the shareholders. The DP Ratio of the firm should be decided in view of the liquidity of the firm, funds required for reinvestment *etc.* A higher DP Ratio or lower DP Ratio may have different consequences.
- Stability of dividend refers to consistency in dividend payment. There may be different types of dividends policies such as Constant DP Ratio, Steady dividend per share. Steady dividend plus extra *etc.*
- While framing the dividend policy, the firm should also keep in view the legal and procedural considerations.
- The Companies Act, 2013, have provided several restrictions on companies for payment of dividend.
- Issue of Bonus shares is another way of distribution of profit among the shareholders. SEBI has announced guidelines for the issue of Bonus shares by companies in India.

GRADED ILLUSTRATIONS

Illustration 11.1

XYZ company expects with some degree of certainty to generate the following profits and to have the following capital investment during the next five years.

(Figures in '000)

Year	1	2	3	4	5
Net Income	₹ 5,000	₹ 4,000	₹ 2,500	₹ 2,000	₹ 1,500
Investment	2,000	2,500	3,200	4,000	5,000

The company currently has 10,00,000 shares of equity and pays dividends of ₹ 5 per share.

(*a*) Determine dividends per share if dividend policy is treated as a residual decision.

(*b*) Determine dividends per share and the amounts of the external financing that will be necessary if a dividend payout ratio of 50% is maintained.

Solution :

CALCULATION OF DIVIDEND PER SHARE

Year	Profit	Investment	Balance	DPS	Ext. Financing
1	₹ 50,00,000	₹20,00,000	₹30,00,000	₹ 3.00	0
2	40,00,000	25,00,000	15,00,000	1.50	0
3	25,00,000	32,00,000	—	0	₹7,00,000
4	20,00,000	40,00,000	—	0	20,00,000
5	15,00,000	50,00,000	—	0	35,00,000

CALCULATION OF DIVIDEND PER SHARE AT 50% PAYOUT

Year	Profit	Dividends	DPS	Investment	Ext. Financing
1	₹ 50,00,000	₹ 25,00,000	₹ 2.50	₹ 20,00,000	—
2	40,00,000	20,00,000	2.00	25,00,000	₹ 5,00,000
3	25,00,000	12,50,000	1.25	32,00,000	19,50,000
4	20,00,000	10,00,000	1.00	40,00,000	30,00,000
5	15,00,000	7,50,000	0.75	50,00,000	42,50,000

Illustration 11.2

Two companies - A Ltd. and B Ltd. are in the same industry with identical earnings per share for the last five years. A Ltd. has a policy of paying 40% of earnings as dividends, while the B Ltd. pays a constant amount of dividend per share. There is disparity between the market prices of the shares of the two companies. The price of the A's share is generally lower than that of the B, even through in some years A Ltd. paid more dividends than B. The data on earnings, dividends and market price for the two companies are as under :

A LTD.

Year	EPS	DPS	Market price
2012	₹ 4.00	₹ 1.60	₹ 12.00
2013	1.50	0.60	8.50
2014	5.00	2.00	13.50
2015	4.00	1.60	11.50
2016	8.00	3.20	14.50

B LTD.

Year	EPS	DPS	Market price
2012	₹ 4.00	₹ 1.80	₹ 13.50
2013	1.50	1.80	12.50
2014	5.00	1.80	12.50
2015	4.00	1.80	12.50
2016	8.00	1.80	15.00

(*i*) Calculate (*a*) payout ratio, (*b*) dividend yield, and (*c*) earning yield for both the companies.

(*ii*) What are the reasons for the differences in the market prices of the two companies share ?

(*iii*) What can be done by the A Ltd. to increase the market price of its shares ?

Solution :

The Payout ratio is : DPS ÷ EPS
The Dividend yield is : DPS ÷ MP
The Earnings yield is : EPS ÷ MP

The following table shows payout, dividend yield and earnings yield for A Ltd. and B Ltd.

Year	Payout		Dividend yield		Earnings yield	
	A Ltd.	B. Ltd.	A Ltd.	B. Ltd.	A Ltd.	B. Ltd.
2012	.40	.45	.13	.13	.33	.30
2013	.40	1.20	.07	.14	.18	.12
2014	.40	.36	.15	.14	.37	.40
2015	.40	.45	.14	.44	.35	.32
2016	.40	.23	.22	.12	.55	.53

It seems that investors evaluate the shares of these two companies in terms of dividend payments. The average dividend per share over a period of five years for both the firms is ₹ 1.80. But the average market price for the B Ltd. (₹ 13.20) has been 10% higher than the average market price for the A Ltd. (₹ 12). The market has used a higher capitalization rate to discount the fluctuating dividend per share of the A Ltd., thus valuing the shares of the A Ltd. at a lower price than that of the B Ltd.

It is obvious that the market evaluates these firms in terms of dividends. A higher market price might be obtained for the shares of the A Ltd., if it increases its dividend payout ratio. The company should evaluate this option in light of funds requirements.

Illustration 11.3

Following information is available in respect of Eriksson Ltd. as on Dec. 31, 2016 :

15% Pref. Share Capital	₹ 10,00,000
Equity Share Capital (FV ₹ 10)	22,00,000
Securities Premium A/c	8,00,000
Reserves	7,00,000
Cash and Bank Balance (after payment of Preference Dividend)	3,50,000

The Profit after tax for the year 2016 is ₹ 6,00,000. The company is contemplating the payment of dividend on Equity Share for the year 2016. You are required to find out:

(*a*) EPS and maximum DPS if 10% of the current year profits are required to be retained.

(*b*) Residual DPS if 10% of current year profits to be retained and fresh investment proposals before the company requires ₹ 2,50,000 for which no borrowing is proposed.

Solution :

EPS of the company :

Profit After Tax	₹ 6,00,000
Less Preference Share Dividend	1,50,000
Profit for Equity Shareholders	4,50,000
EPS (4,50,000 ÷ 2,20,000)	2.045

Maximum DPS :

Profit After Tax	₹ 6,00,000
Less Retained earnings	60,000
Profit available for distribution	5,40,000
Pref. Share dividend	1,50,000
Profit for Equity shareholders	3,90,000
Cash and Bank balance	3,50,000

The company can distribute dividends of ₹ 3,90,000 but the cash available is only ₹3,50,000. So, maximum DPS is ₹ 1.59 (*i.e.*, 3,50,000 ÷ 2,20,000).

If the company has investment plans of ₹ 2,50,000, then the cash available is only ₹ 1,00,000 and the maximum DPS would be ₹ 0.45 (*i.e.*, 100,000 ÷ 2,20,000).

Illustration 11.4

Import Replacement Ltd. specialises in producing goods to substitute imports from the USA. The managing director of the company, Ajay, is seriously concerned about the dividend payout policy of the company. He has asked you as a company secretary-*cum*-finance director to suggest dividend payout under each of the following alternative policies :

Policy I : A dividend payout of ₹ 2.00 per share, increasing by ₹ 0.20 per share over the previous year whenever the dividend payout falls below 50% for the two consecutive years.

Policy II : A dividend payout of ₹ 1.00 per share for each period except when earnings per share exceed ₹ 6.00 when an extra dividend equal to 80% of earnings beyond ₹ 6.00 would be paid.

The earnings per share of the company over the last 10 years is shown in the following table :

Year	Earnings per Share
2016	₹ 8.00
2015	7.60
2014	6.40
2013	5.60
2012	6.40
2011	4.80

Year	Earnings per Share
2010	2.40
2009	3.60
2008	1.00
2007	0.50

You are also required to discuss the *pros* and *cons* of each of the dividend policies mentioned above.

Solution :

CALCULATION OF DIVIDEND PAYOUT UNDER ALTERNATIVE POLICIES

Year	Earning per share	Policy I	Policy II
2016	₹ 8.00	₹ 3.00	₹ $1.00 + (2 \times 0.80) = 2.60$
2015	7.60	2.80	$1.00 \times (1.60 \times 0.80) = 2.28$
2014	6.40	2.60	1.32
2013	5.60	2.40	1.00
2012	6.40	2.20	$1.00 + (0.40 \times 0.80) = 1.32$
2011	4.80	2.00	1.00
2010	2.40	2.00	1.00
2009	3.60	2.00	1.00
2008	1.00	2.00	1.00
2007	0.50	2.00	1.00

The above calculations are based on the assumption that the company has adequate reserves to pay dividends when profits are low. Under Policy I, the company pays a constant amount of dividend of ₹ 2 per share and enhanced amount of dividend of ₹ 0.20 per share over the previous years when dividend-payout ratio falls below 50% for two consecutive years. This policy provides the owners with information indicating that the firm is okay. Under this Policy, the firm pays dividend even when earning is inadequate and thus provide stability in the dividend payment.

Under Policy II, the company pays dividend at ₹ 1 per share and extra dividend when earning exceeds ₹ 6. This policy is in nature of low regular plus extra dividend policy. By establishing a low regular dividend that is paid each period, the firm gives investors the stable income necessary to build confidence in the company and the extra dividend permits them to share in the earnings from an especially good period.

OBJECTIVE TYPE QUESTIONS

State whether each of the following statements is ***True (T)*** *or* ***False (F)****.*

(*i*) DP ratio of a firm should be directly related to future growth plans of the firm.

(*ii*) Dividends are paid out of profit and therefore does not affect the liquidity position of the firm.

(*iii*) Stability of dividend refers to the fact that the rate of divided must be fixed.

(*iv*) While designing a dividend policy, the legal provisions may be considered by the firm.

(*v*) Cash dividend and bonus share issue affect the firm in the same way.

(*vi*) Capital profits can never be distributed as dividends to the shareholders.

(*vii*) In India, there is a restriction on the rate of dividend being paid by a company.

(*viii*) Constant DP ratio-refers to stability of dividend.

(*ix*) Stability of dividend does not affect the market price of the share.

(*x*) No company in India, can pay final dividend unless it has already paid an interim dividend.

[**Answers :** *(i) T, (ii) F, (iii) F, (iv) F, (v) F, (vi) F, (vii) F, (viii) T, (ix) F, (x) F.*]

MULTIPLE CHOICE QUESTIONS

1. Dividend Payout Ratio is :

(*a*) PAT ÷ Capital

(*b*) DPS ÷ EPS

(*c*) Pref. Dividend ÷ PAT

(*d*) Pref. Dividend ÷ Equity Dividend

2. Dividend declared by a company must be paid in :

(*a*) 20 days

(*b*) 30 days

(*c*) 32 days

(*d*) 42 days

3. Dividend Distribution Tax is payable by :

(*a*) Shareholders to Government

(*b*) Shareholders to Company

(*c*) Company to Government

(*d*) Holding to Subsidiary Company

4. Shares of face value of ₹ 10 are 80% paid up. The company declares a dividend of 50%. Amount of dividend per share is :

(*a*) ₹ 5

(*b*) ₹ 4

(*c*) ₹ 80

(*d*) ₹ 50

5. Which of the following generally not result in increase in total dividend liability ?

(*a*) Share-split

(*b*) Right Issue

(*c*) Bonus Issue

(*d*) All of the above

6. Dividends are paid out of :

(*a*) Accumulated Profits

(*b*) Gross Profit

(*c*) Profit after Tax

(*d*) General Reserve

6. In India, Dividend Distribution tax is paid on :

(*a*) Equity Share

(*b*) Preference Share

(*c*) Debenture

(*d*) Both (*a*) and (*b*)

7. In India, if dividend on equity shares is not paid within 30 days it is transferred to Investors Education and Protection Fund in :

(*a*) 2 days

(*b*) 3 days

(*c*) 4 days

(*d*) 7 days

8. Every company should follow :

(*a*) High Dividend Payment

(*b*) Low Dividend Payment

(*c*) Stable Dividend Payment

(*d*) Fixed Dividend Payment

9. 'Constant Dividend Per Share' Policy is considered as :

(*a*) Increasing Dividend Policy

(*b*) Decreasing Dividend Policy

(*c*) Stable Dividend Policy

(*d*) None of the above

10. Which of the following is not a type of dividend payment ?

(*a*) Bonus Issue

(*b*) Right Issue

(*c*) Share Split

(*d*) Both (*b*) and (*c*)

11. Which of the following is an element of dividend policy ?

(*a*) Production capacity

(*b*) Change in Management

(*c*) Informational content

(*d*) Debt service capacity

12. Stability of dividend policy means that

(*a*) Same amount of dividend be paid every year

(*b*) Dividends be paid regularly two-three time in a year

(*c*) Extra dividend be paid every year

(*d*) There need not be much variation in dividend payment over years.

13. Stock split is a form of :

(*a*) Dividend Payment

(*b*) Bonus issue

(*c*) Financial restructuring

(*d*) Dividend in kind

14. In stock dividend,

(*a*) Authorized capital always increases

(*b*) Paid up capital always increases

(*c*) Face value per share decreases

(*d*) Market price for share decreases

15. Which of the following is not considered in Lintner's Model ?

(*a*) Dividend payout ratio

(*b*) Current EPS

(*c*) Speed of Adjustment

(*d*) Preceding year EPS

16. Which of the following is not relevant for dividend payment for a year ?

(*a*) Cash flow position

(*b*) Profit position

(*c*) Paid up capital

(*d*) Retained Earnings

[**Answers :** *1(b), 2(b), 3(c), 4(b), 5(a), 6(c), 7(d), 8(c), 9(c), 10(c), 11(c), 12(d), 13(c), 14(d), 15(d), 16(d)*].

ASSIGNMENTS

1. Write short notes on:

(*a*) Dividend Payout Ratio,

(*b*) Stability of Dividends.

(*i*) Stock-split. *[B.Com. (H.), D.U., 2014]*

2. Explain Stable Dividend Policy. What is the significance of stability of dividend?

[B.Com. (H.), D.U., 2008, 2012, 2016]

3. What of the two dividend policies, Steady dividends or dividends fluctuating with earnings, would you recom-

mend? Would your recommendation be different for a new company, as district from one which has been in existence for a period of ten years.

4. What are the main determinants of Dividend Policy of a firm ? *[B.Com. (H.), D.U., 2018]*

5. What do you mean by the Optimal Dividend Policy ? Explain.

6. "The primary purpose for which a firm exists is the payment of dividend. Therefore, irrespective of the firm's needs and the desires of shareholders, a firm should follow a policy of very high dividend payout". Do you agree ?

7. Why do companies pay dividends? Explain.

8. Explain briefly the factors which influence the dividend policy of a firm.
[B.Com. (H.), D.U., 2009, 2011, 2013, 2015]

9. "Financial management can use dividend policy to maximize the wealth position of equity holders". Explain in detail the above statement with reference to the determinants of dividend policy.

10. What is "informational contents" of dividend payment ? Explain how does it affect share value ?
[B.Com. (H.), D.U., 2008, 2018]

11. To what extent are firms able to establish a definite long-run dividend policy ? What factors would affect these policies? To what extent might these policies affect market value of a firm's securities ? Explain.

12. What are the effects of bonus issue on EPS and market price of a share ? *[B.Com. (H.), D.U., 2013]*

13. Why is dividend policy important for a firm? Also discuss the various determinants of a dividend policy in a company.

14. Discuss the Walter's model and Gordon's model *vis-a-vis* dividend policy.

15. Explain the relationship between earnings, cash flows and dividend payout.

16. "Stability in dividend payment has a marked bearing on the market price of a share of a firm". Explain.

17. 'Issue of Bonus shares does not affect the liquidity position of the company'. Comment on the above in the light of effects of Bonus.

18. What is stock dividend? What is its rationale?
[B.Com. (H.), D.U., 2017]

PART V

MANAGEMENT OF CURRENT ASSETS

The management of current assets deals with determination, maintenance, control and monitoring of level of all the individual current assets. For the efficient and optimal use of fixed assets, the existence and necessity of current assets is implied. The current assets provide liquidity and smoothness to a firm in its operations. Since the current assets change regularly, the concept of time value of money is not applied. Rather, the concept of risk-return trade-off is extensively used in the management of current assets.

In a business firm, current assets may be classified in cash, marketable securities, receivables and inventory, and a financial manager is concerned with the determination of total current assets (gross working capital) as well as net working capital (excess of current assets over current liabilities). Each of the current assets itself is to be managed in the light of specific considerations. As the current assets are short lived, the funds required for their acquisition should also be arranged from short term sources of finance as bank credit etc. Part V deals with the management of current assets (Total as well as individual). The learning objectives are :

- What is Working Capital Management and what factors determine the working capital requirement?
- What are the different approaches to financing of working capital requirement?
- What is operating cycle and how is it determined ?
- How and what are the considerations in management of individual current assets?
- What are the different short term sources of funds?

CONTENTS

CHAPTER 12	**:**	WORKING CAPITAL : PLANNING AND MANAGEMENT
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CHAPTER 16	**:**	INVENTORY MANAGEMENT

CHAPTER

12

Working Capital : Planning and Management

"Working Capital, also called net current assets, is the excess of current assets over current liabilities. All organizations have to carry working capital in one form or the other. The efficient management of working capital is important from the point of view of both liquidity and profitability. Poor management of working capital means that funds are unnecessarily tied up in idle assets hence reducing liquidity and also reducing the ability to invest in productive assets such as plant and machinery, so affecting the profitability."[1]

SYNOPSIS

- Introduction to Working Capital Management.
- Operating Cycle.
- Factors Affecting Working Capital Requirements.
- Need for adequate Working Capital.
- Working Capital Policy and Management
  - Types of Working Capital Policy.
  - Liquidity and Profitability.
  - Permanent and Temporary Working Capital.
- Financing of Working Capital.
  - Hedging Approach.
  - Conservative Approach.
  - Aggressive Approach.
- Working Capital : Monitoring and Control.
- Graded Illustrations in Working Capital Management.

1. Woolf, Tanna and Karam Singh, *Financial Management,* MacDonald and Evans, Plymouth, First Edition, p. 245.

The working capital management refers to management of the working capital, or to be more precise, the management of current assets. A firm's working capital consists of its investment in current assets which include short term assets such as cash and bank balance, inventories, receivables (including debtors and bills), and marketable securities. Working capital management refers to the management of the level of all these individual current assets. The need for working capital management arises from two considerations. First, existence of working capital is imperative in any firm. The fixed assets which usually require a large chunk of total funds, can be used at an optimum level only if supported by sufficient working capital, and second, the working capital involves investment of funds of the firm. If the working capital level is not properly maintained and managed, then it may result in unnecessary blocking of scarce resources of the firm. The insufficient working capital, on the other hand, put different hindrances in smooth working of the firm. Therefore, the working capital management needs attention of all the financial managers.

The working capital management includes the management of the level of individual current assets as well as the management of total working capital. However, each individual current assets has unique characteristics which the financial manager must consider in deciding how much money should be invested in each of these current assets. In other words, he must decide the level of all the current assets. The management of individual current assets *i.e.*, cash and bank balance, marketable securities, receivables and inventories has been taken up in subsequent chapters. However, the general principles of working capital management have been taken up in this chapter.

Nature and Types of Working Capital : The term working capital refers to current assets which may be defined as (*i*) those which are convertible into cash or equivalents within a period of one year, and (*ii*) those which are required to meet day to day operations. The fixed assets as well as the current assets, both requires investment of funds. So, the management of working capital and of fixed assets, apparently, seem to involve same types of considerations but it is not so.

The management of working capital involves different concepts and methodology than the techniques used in fixed assets management. The reason for this difference is obvious. The very basics of fixed assets decision process (*i.e.*, the capital budgeting) and the working capital decision process are different. The fixed assets involve long period perspective and therefore, the concept of time value of money is applied in order to discount the future cash flows; whereas in working capital the time horizon is limited, in general, to one year only and the time value of money concept is not considered. The fixed assets affect the long term profitability of the firm while the current assets affect the short term liquidity position. The fixed assets decisions, as already discussed in Chapter 8, are irreversible and affect the growth of the firm, whereas the working capital decisions can be changed and modified without much implications.

Managing current assets may require more attention than managing fixed assets. The financial manager cannot simply decide the level of the current assets and stop there. The level of investment in each of the current assets varies from day to day, and the financial manager must therefore, continuously monitor these assets to ensure that the desired levels are being maintained. Since, the amount of money invested in current assets can change rapidly, so does the financing required. Mismanagement of current assets can be costly. Too large an investment in current assets means tying up funds that can be productively used elsewhere (or it means added interest cost if the firm has borrowed funds to finance the investment in current assets). Excess investment may also expose the firm to undue risk *e.g.*, in case, the inventory cannot be sold or the receivables cannot be collected.

On the other hand, too little investment also can be expensive. For example, insufficient inventory may mean that sales are lost as the goods which a customer wants are not available. The result is that the financial managers spend a large chunk of their time managing the current assets because level of these assets changes quickly and a lack of attention paid to them may result in appreciably lower profits for the firm. So, in the working capital management, a financial manager is faced with a decision involving some of the considerations as follows :

1. What should be the total investment in working capital of the firm?
2. What should be the level of individual current assets ?
3. What should be the relative proportion of different sources to finance the working capital requirements ?

Thus, the working capital management may be defined as the management of firm's sources and uses of working capital in order to maximize the wealth of the shareholders. The proper working capital management requires both the medium term planning (say up to three years) and also the immediate adaptations to changes arising due to fluctuations in operating levels of the firm.

The term working capital may be used in two different ways :

(*i*) **Gross Working Capital (or Total Working Capital) :** The gross working capital refers to the firm's investment in all the current assets taken together. The total of investments in all the individual current assets is the gross working capital. For example, if a firm has a cash balance of ₹ 50,000, debtors of ₹ 70,000 and inventory of raw material and finished goods has been assessed at ₹ 1,00,000, then the gross working capital of the firm is ₹ 2,20,000 (*i.e.*, ₹50,000 + ₹70,000 + ₹ 1,00,000).

(*ii*) **Net Working Capital :** The term net working capital may be defined as the excess of total current assets over total current liabilities. It may be noted that the current liabilities refer to those liabilities which are payable within a period of 1 year. The extent, to which the payments to these current liabilities are delayed, the firm gets the availability of funds for that period. So, a part of the funds

required to maintain current assets is provided by the current liabilities and the firm will be required to invest the funds in only those current assets which are not financed by the current liabilities.

The net working capital may either be positive or negative. If the total current assets are more than total current liabilities, then the difference is known as positive net working capital, otherwise the difference is known as negative net working capital. The net working capital measures the firm's liquidity. The greater the margin (*i.e.*, net working capital) by which the firm's current assets cover its current liabilities, the better will it be. Although the firm's current assets may not be converted into cash precisely when they are needed, still greater net working capital assures that in all likelihood some current assets will be converted into cash to pay the current liabilities.

The distinction between gross working capital and net working capital does not in any way undermine the relevance of the concepts of either gross or net working capital. A financial manager must consider both of them because they provide different interpretations. The gross working capital denotes the total working capital or the total investment in current assets. A firm should maintain an optimum level of gross working capital. This will help avoiding (*i*) the unnecessarily stoppage of work or chance of liquidation due to insufficient working capital, and (*ii*) effect on profitability (because over flowing working capital implies cost). Therefore, a firm should have just adequate level of total current assets. The gross working capital also gives an idea of total funds required for maintaining current assets.

On the other hand, net working capital refers to the amount of funds that must be invested by the firm, more or less, regularly in current assets. The remaining portion of current assets being financed by the current liabilities. The net working capital also denotes the net liquidity being maintained by the firm. This also gives an idea of buffer available to the current liabilities.

Both concepts of working capital *i.e.*, the gross working capital and the net working capital have their own relevance and a financial manager should give due attention to both of these.

THE OPERATING CYCLE AND WORKING CAPITAL NEEDS

The working capital requirement of a firm depends, to a great extent upon the operating cycle of the firm. The operating cycle may be defined as the time duration starting from the procurement of goods or raw materials and ending with the sales realization. The length and nature of the operating cycle may differ from one firm to another depending upon the size and nature of the firm.

In a trading concern, there is a series of activities starting from procurement of goods (saleable goods) and ending with the realization of sales revenue (at the time of sale itself in case of cash sales and at the time of debtors realizations in case of credit sales). Similarly, in case of manufacturing concern, this series starts from procurement of raw materials and ending with the sales realization of finished goods (after going through the different stages of production). In both the cases, however, there is a time gap between the happening of the first event and the happening of the last event. This time gap is called the ***Operating Cycle.***

Thus, the operating cycle of a firm consists of the time required for the completion of the chronological sequence of some or all of the following :

(*i*) Procurement of raw materials and services.

(*ii*) Conversion of raw materials into work-in-progress.

(*iii*) Conversion of work-in-progress into finished goods.

(*iv*) Sale of finished goods (cash or credit).

(*v*) Conversion of receivables into cash.

These activities create and necessitate cash flows which are neither synchronized nor certain. The relevant cash flows are not synchronized because the cash disbursements (*i.e.*, payment for purchases) take place before the cash inflows (from sales realizations). These cash flows are uncertain because these depend upon the future costs and sales. Of course, the cash outflows relating to payment for purchases and payment for wages and other expenses are less uncertain with respect to time as well as quantum. What is required on the part of a firm is to make adjustments and arrangements so that the uncertainty and unsynchronization of these cash flows can be taken care of.

The firm is often required to extend credit facilities to customers. The finished goods must be kept in store to take care of the orders and a minimum cash balance must be maintained. It must also have a minimum of raw materials to have smooth and uninterrupted production process. So, in order to have a proper and smooth running of the business activities, the firm must make investments in all these current assets. This requirement of funds depends upon the operating cycle period of the firm and is also denoted as the working capital needs of the firm.

Operating Cycle Period : The length or time duration of the operating cycle of any firm can be defined as the sum of its inventory conversion period and the receivable conversion period.

(*i*) **Inventory Conversion Period (ICP) :** It is the time required for the conversion of raw materials into finished goods sales. In a manufacturing firm the ICP is consisting of Raw Material Conversion Period (RMCP), Work-in-Progress Conversion Period (WPCP), and the Finished Goods Conversion Period (FGCP). The RMCP refers to the period for which the raw material is generally kept in stores before it is issued to the production department. The WPCP refers to the period for which the raw materials remain in the production process before it is taken out as a finished unit. The FGCP refers to the period for which finished units remain in stores before being sold to the customers.

(*ii*) **Receivables Conversion Period (RCP) :** It is the time required to convert the credit sales into cash realization. It refers to the period between the occurrence of credit sales and collection of debtors.

The total of ICP and RCP is also known as Total Operating Cycle Period (TOCP). The firm might be getting some credit facilities from the supplier of raw materials, wage earners *etc.* The period for which the payments to these parties are deferred or delayed is known as Deferral Period (DP). The Net Operating Cycle (NOC) of the firm is arrived at by deducting the DP from the TOCP. Thus,

$$\begin{aligned} NOC &= TOCP - DP \\ &= ICP + RCP - DP \end{aligned}$$

The operating cycle of a firm has been shown in Figure 12.1.

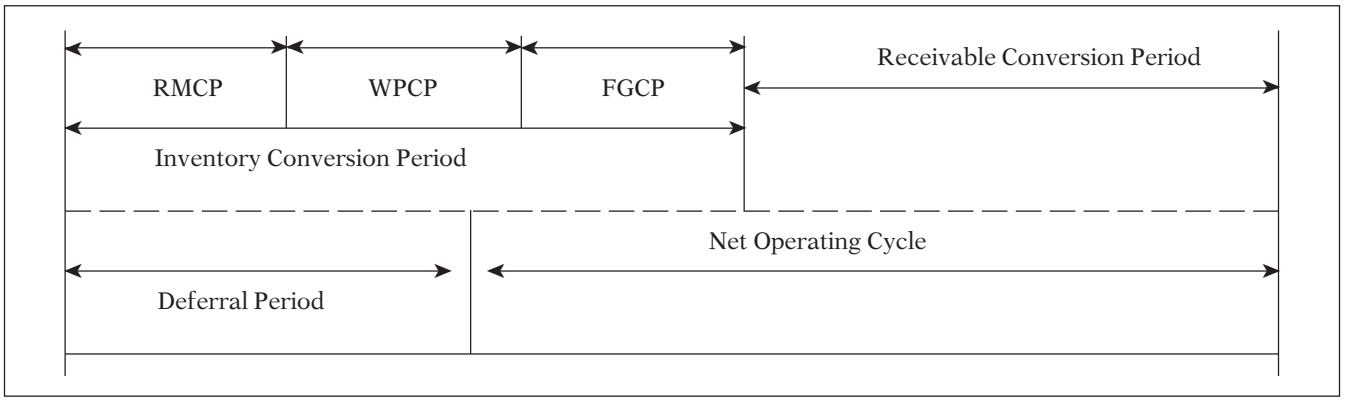

FIGURE 12.1: THE OPERATING CYCLE

For calculation of TOCP and NOC, various conversion periods may be calculated as follows :

$$RMCP = \frac{\text{Average Raw Material Stock}}{\text{Total Raw material consumption}} \times 365$$

$$WPCP = \frac{\text{Average Work-in-progress}}{\text{Total Cost of production}} \times 365$$

$$FGCP = \frac{\text{Average Finished Goods}}{\text{Total Cost of goods sold}} \times 365$$

$$RCP = \frac{\text{Average Receivable}}{\text{Total Credit sales}} \times 365$$

$$DP = \frac{\text{Average Creditors}}{\text{Total Credit purchase}} \times 365$$

In respect of these formulations, the following points are worth noting :

1. The 'Average' value in the numerator is the average of opening balance and closing balance of the respective item. However, if only the closing balance is available, then even the closing balance may be taken as the 'Average'.
2. The figure '365' represents number of days in a year. However, there is no hard and fast rule and sometimes even 360 days are considered.
3. The 'Total' figure in the denominator refers to the total value of the item in a particular year, and
4. In the calculation of RMCP, WPCP, and FGCP, the denominator is calculated at cost-basis and the profit margin has been excluded. The reason being that there is no investment of funds in profit as such.

On the basis of above conversion periods, the TOCP and NOC may be ascertained as follows :

Particulars	Number of Days
RMCP	..... Days
+WPCP	..... Days
+FGCP	..... Days
+RCP	..... Days
TOCP	..... Days
–DP	..... Days
NOC	..... Days

The TOCP and NOC do not measure the absolute amount of funds invested in working capital. However, a longer NOC will generally indicate a requirement for more working capital. Lesser amount of working capital will be required at the beginning of the operating cycle than at the end because most of the expenses are incurred well after initial raw materials are procured and introduced in the production process. The operating cycle for an individual component keeps on changing from time to time, particularly the RCP and the DP. Therefore, a regular attention and review is required. It would be extremely difficult to determine an optimum operating cycle for a particular firm. The comparison of firm's operating cycle for a period with that of the previous period and with that of the operating cycle of other firms may help in maintaining and controlling the length of the operating cycle. Example 12.1 explains the procedure for the calculation of Operating Cycle of the firm.

Example 12.1

From the following information taken from the books of a manufacturing concern, compute the operating cycle in days :

Period covered	365 days
Average period of credit allowed by suppliers	16 days

	(₹ in '000)
Average debtors outstanding	480
Raw materials consumption	4,400
Total production cost	10,000
Total cost of goods sold	10,500
Sales for the year	16,000
Value of average stock maintained :	
Raw materials	320
Work-in-progress	350
Finished goods	260

Solution :

Operating Cycle of XYZ Ltd.

1. **Raw Material :** $\frac{\text{Average Raw Materials}}{\text{Raw Material Consumed}} \times 365 = \frac{320}{4,400} \times 365 = 27 \text{ days}$

2. **Work-in-progress:** $\frac{\text{Average Work-in-progress}}{\text{Total Cost of Production}} \times 365 = \frac{350}{10,000} \times 365 = 13 \text{ days}$

3. **Finished Goods:** $\frac{\text{Average Stock}}{\text{Total Cost of Goods Sold}} \times 365 = \frac{260}{10,500} \times 365 = 9 \text{ days}$

4. **Debtors:** $\frac{\text{Average Debtors}}{\text{Credit Sales}} \times 365 = \frac{480}{16,000} \times 365 = 11 \text{ days}$

The credit allowed by Creditors = 16 days

$$\begin{aligned} \text{TOCP} &= \text{RMCP} + \text{WPCP} + \text{FGCP} + \text{RCP} \\ &= 27 + 13 + 9 + 11 = 60 \text{ days} \\ \text{NOC} &= \text{TOCP} - \text{DP} \\ &= 60 - 16 = 44 \text{ days} \end{aligned}$$

Therefore, the firm has a NOC of 44 days.

FACTORS DETERMINING WORKING CAPITAL REQUIREMENT

The working capital needs of a firm are determined and influenced by various factors. A wide variety of considerations may affect the quantum of working capital required and these considerations may vary from time to time. The working capital needed at one point of time may not be good enough for some other situation. The determination of working capital requirement is a continuous process and must be undertaken on a regular basis in the light of the changing situations. Following are some of the factors which are relevant in determining the working capital needs of the firm :

1. **Basic Nature of Business :** The working capital requirement is closely related to the nature of the business of the firm. In case of a retail shop or a trading firm, the amount of working capital required is small enough. Most of the transactions are undertaken in cash and the length of the operating cycle is generally small. The trading concerns usually have smaller needs of working capital, however, in certain cases, large inventories of goods may be required and consequently the working capital may be large. In case of financial concerns (engaged in financial business) there may not be stock of goods but these firms do have to maintain sufficient liquidity all the times. In case of manufacturing concerns, different types of production processes are performed. One unit of raw material introduced in the production schedule may take a long period before it is available as finished goods for sale. Funds are blocked not only in raw materials but also in labour expenses and overheads at every stage of production. So, in case of manufacturing concerns, there is a requirement of substantial working capital.

2. **Business Cycle Fluctuations :** Different phases of business cycle *i.e.*, boom, recession, recovery *etc.* also affect the working capital requirement. In case of boom conditions, inflationary pressure appears and business activities expand. As a result, the overall need for cash, inventories *etc.* increases resulting in more and more funds blocked in these current assets. In case of recession period however, there is usually a dullness in business activities and there will be an opposite effect on the level of working capital requirement. There will be a fall in inventories and cash requirement *etc.*

3. **Seasonal Operations :** If a firm is operating in goods and services having seasonal fluctuations in demand, then the working capital requirement will also fluctuate with every change. In a cold drink factory, the demand will certainly be higher during summer season and therefore, more working capital is required to maintain higher production, in the form of larger inventories and bigger receivables. On the other hand, if the operations are smooth and even throughout the year then the working capital requirement will be constant and will not be affected by the seasonal factors.

4. **Market Competitiveness :** The market competitiveness has an important bearing on the working capital needs of a firm. In view of the competitive conditions prevailing in the market, the firm may have to offer liberal credit terms to the customers resulting in higher debtors. Even larger inventories may be maintained to serve an order as and when received; otherwise the customer may go to some other supplier. Thus, the working capital tends to be high as a result of greater investment in inventories and receivables. On the other hand, a monopolistic firm may not require larger working capital. It may ask the customers to pay in advance or to wait for some time after placing the order.

5. **Credit Policy :** The credit policy means the totality of terms and conditions on which goods are sold and purchased. A firm has to interact with two types of credit policies at a time. One, the credit policy of the supplier of raw materials, goods *etc.*, and two, the credit policy relating to credit which it extends to its customers. In both the cases, however, the firm while deciding its credit policy, has to take care of the credit policy of the market. For example, a firm might be purchasing goods and services on credit terms but selling goods only for cash. The working capital requirement of this firm will be lower than that of a firm which is purchasing cash but has to sell on credit basis.

6. **Supply Conditions :** The time taken by a supplier of raw materials, goods *etc.* after placing an order, also deter-

mines the working capital requirement. If goods are received as soon as or in a short period after placing an order, then the purchaser will not like to maintain a high level of inventory of that goods. Otherwise, larger inventories should be kept *e.g.*, in case of imported goods. It is often seen that the shopkeepers may not be keeping stock of all items, but whenever there is a demand, they procure from the wholesaler/producer and supply it to their customers.

Thus, the working capital requirement of a firm is determined by a host of factors. Every consideration is to be weighted relatively to determine the working capital requirement. Further, the determination of working capital requirement is not once a while exercise, rather a continuous review must be made in order to assess the working capital requirement in the changing situation. There are various reasons which may require the review of the working capital requirement *e.g.*, change in credit policy, change in sales volume, *etc.*

NEED FOR ADEQUATE WORKING CAPITAL : The need and importance of adequate working capital for day to day operations can hardly be underestimated. Every firm must maintain a sound working capital position otherwise, its business activities may be adversely affected. The financial manager must see that the firm has sufficient working capital as and when required so that the fixed assets of the firm are optionally used. The objective of financial management *i.e.*, to maximize the wealth of the shareholder cannot be attained if the operations of the firm are not optimized. Thus, every firm must have adequate working capital. It should have neither the excessive working capital nor inadequate working capital. Both situations are risky and may have dangerous outcome. The excessive working capital, when the investment in working capital is more than the required level, may result in

(*a*) Unnecessary accumulation of inventories resulting in waste, theft, damage *etc.*

(*b*) Delays in collection of receivables resulting in more liberal credit terms to customers than warranted by the market conditions.

(*c*) Adverse influence on the performance of the management.

On the other hand, inadequate working capital situation, when the firm does not have sufficient working capital to support its operations, is also not good for the firm. Such a situation may have following consequences :

(*i*) The fixed assets may not be optimally used.

(*ii*) Firms growth may stagnate.

(*iii*) Interruptions in production schedule may occur ultimately resulting in lowering of the profit of the firm.

(*iv*) The firm may not be able to take benefit of an opportunity.

(*v*) Firm's goodwill in the market is affected if it is not in a position to meet its liabilities on time.

In view of the above, it can be said that the management of a firm in general and the financial manager in particular, must understand the importance of adequate working capital. In other words, the working capital level of a firm must be maintained and managed at an appropriate level. The financial manager must establish (*i*) a well defined working capital policy and (*ii*) a self sufficient working capital management system. While designing the working capital policy, the financial manager should take care of the following aspects:

(*a*) What should be the level of total and individual current assets in view of the expected sales level?

(*b*) The financing pattern of the total working capital needs.

The working capital system should be established to take care of management of all aspects of the current assets. Efforts should be made to establish a built-in internal control system to take note of the level as well as fluctuations in all components of the working capital. Different aspects of working capital policy and management have been discussed in the following section.

WORKING CAPITAL : POLICY AND MANAGEMENT

The working capital management includes and refers to the procedures and policies required to manage the working capital. It may be noted that the long term profitability of a firm, undoubtedly, depends upon the investment decisions of a firm. The investment decisions determine the pattern of sales growth and sales in turn, determine the profitability. However, the investment decisions and other decisions have two important implications for working capital management. First, the sales forecast of goods and services being produced by the firm allow the financial manager to estimate the working capital needs and level of different current assets. Second, the working capital management helps maximizing the shareholders wealth by providing and maintaining firm's liquidity. The working capital management need not necessarily have a target of increasing the wealth of the shareholders, nevertheless it helps attaining the objective by providing sufficient liquidity to the firm.

The importance of working capital management, thus, can be expressed in terms of the following points :

(*i*) The level of current assets changes constantly and regularly depending upon the level of actual and forecasted sales. This requires that the decisions to bring a level of current assets to the desired levels of current assets should be made at the earliest opportunity and as frequently as required.

(*ii*) The changing levels of current assets may also require review of the financing pattern. How much working capital needs to be financed by different sources of financing must be periodically reviewed.

(*iii*) Inefficient working capital management may result in loss of sales and consequently decline in profits of the firm.

(*iv*) Inefficient working capital management may also lead to insolvency of the firm if it is not in a position to meet its liabilities and commitments.

(*v*) Current assets usually represent a substantial portion of the total assets of the firm, resulting in investment of a larger chunk of funds in the current assets.

(*vi*) There is an obvious and inevitable relationship between the sales growth and the level of current assets. The target sales level can be achieved only if supported by adequate working capital. The increase in sales level requires increase in working capital and thus the financial manager must be able to respond quickly in providing and arranging additional working capital.

Thus, the efficient working capital management is important from the point of view of both the liquidity and the profitability. Poor and inefficient working capital management means that funds are unnecessarily tied up in idle assets. This reduces the liquidity as well as the ability to invest funds in productive assets, so affecting the profitability. Keeping in view the importance of working capital management, the financial manager should look into the framing of a suitable working capital policy for the firm. Following are some of the important aspects of a working capital policy.

Determining the Ratio of Current Assets to Sales : As already said that there is an inevitable relationship, between the sales and the current assets. The actual and the forecasted sales have a major impact on the amount of current assets which the firm must maintain. So, depending upon the sale forecast, the financial manager should also estimate the requirement of current assets. However, as the sales forecast cannot be certain, so is the case with the forecast of current assets also. This uncertainty may result in spontaneous increase in current assets in line with the increase in sales level, and may bring the firm to face tight working capital position. In order to overcome this uncertainty, the financial manager may establish a minimum level as well as a safety component for each of the current assets for different levels of sales. But how much should be this safety component? It may be noted that in fact, this safety component determines the type of working capital policy a firm is pursuing. There are three types of working capital policies which a firm may adopt *i.e.*, moderate working capital policy, conservative working capital policy and aggressive working capital policy. These policies describe the relationship between sales level and the level of current assets and have been shown in Figure 12.2.

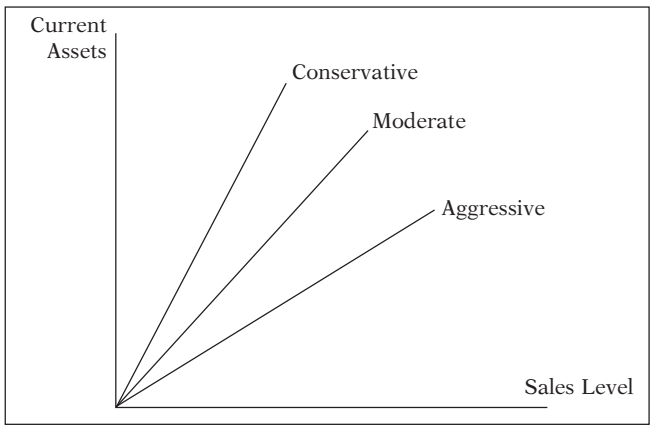

FIG.12.2 : DIFFERENT TYPES OF WORKING CAPITAL POLICIES.

Figure 12.2 shows that in case of moderate working capital policy, the increase in sales level will be coupled with proportionate increase in level of current assets also e.g., if the sales increase or are expected to increase by 10%, then the level of current assets will also be increased by 10%. In case of conservative working capital policy, the firm does not like to take risk. For every increase in sales, the level of current assets will be increased more than proportionately. Such a policy tends to reduce the risk of shortage of working capital by increasing the safety component of current assets. The conservative working capital policy also reduces the risk of non-payment to liabilities.

On the other hand, a firm is said to have adopted an aggressive working capital policy if the increase in sales does not result in proportionate increase in current assets. For example, for 10% increase in sales the level of current assets is increased by 7% only. This type of aggressive policy has many implications. First, the risk of insolvency of the firm increases as the firm maintains lower liquidity. Second, the firm is exposed to greater risk as it may not be able to face unexpected change market and, third, reduced investment in current assets will result in increase in profitability of the firm.

LIQUIDITY *v.* PROFITABILITY - A RISK-RETURN TRADE-OFF

Another important aspect of a working capital policy is to maintain and provide sufficient liquidity to the firm. Like most corporate financial decisions, the decision on how much working capital be maintained involves a trade-off because having a large net working capital may reduce the liquidity-risk faced by the firm, but it can have a negative effect on the cash flows. Therefore, the net effect on the value of the firm should be used to determine the optimal amount of working capital. A firm must maintain enough cash balance or other liquid assets so that it never faces problems of payment to liabilities. Does it mean that a firm should maintain unnecessarily large liquidity to pay the creditors? Can a firm adopt such a policy? Certainly not. There is also another side of the coin. Greater liquidity makes the firm meeting easily its payment commitments, but simultaneously greater liquidity involves cost also.

The risk-return trade-off involved in managing the firm's working capital is a trade-off between the firm's liquidity and its profitability. By maintaining a large investment in current assets like cash, inventory, *etc.*, the firm reduces the chances of (*i*) production stoppages and the lost sales from the inventory shortages, and (*ii*) the inability to pay the creditors on time. However, as the firm increases its investment in working capital, there is not a corresponding increase in its expected returns. This means that the firm's return on investment drops because the profit are unchanged while the investment in current assets increases.

In addition to the above, the firm's use of current liability *versus* long term debt also involves a risk-return trade-off. Other things being equal, the greater the firm's reliance on the short term debts or current liabilities in financing its current assets, the greater the risk of illiquidity. On the other hand, the use of current liability can be advantageous as it is less costly and flexible means of financing. A firm can reduce its risk of illiquidity through the use of long term debts at the cost of reduction in its return on investment. The risk-return trade-

off thus involves an increased risk of illiquidity and the profitability.

In order to discuss the risk-return trade-off, the following assumptions are made :

(*a*) That the current assets are less profitable than the fixed assets,

(*b*) Short term funds are cheaper than long term funds, and

(*c*) The firm has a fixed level of total funds inclusive of long term funds and short term funds; and a fixed level of total assets inclusive of current assets and fixed assets.

The effect of changing levels of current assets on the risk-return trade-off can be demonstrated as follows :

For a given firm, if the level of current assets is increased (it impliedly means that the fixed assets will reduce by the same amount) then the liquidity position of the firm will also increase and it will be easily meeting its payment commitments. But simultaneously its profit will decrease as the level of fixed assets has gone down. In other words, when the level of current assets is increased, the liquidity of the firm increases but there is always a cost associated with the increased liquidity. More and more funds will be blocked in current assets which are less profitable and therefore, the profitability of the firm will suffer.

Now, in order to increase the profitability, the firm reduces the current assets (and thereby increasing the fixed assets). Consequently, the profitability of the firm will increase but the liquidity will be reduced. The firm is now exposed to a greater risk of insolvency. The risk return syndrome can be summed up as follows : When liquidity increases, the risk of insolvency is reduced but the profitability is also reduced. However, when the liquidity is reduced, the profitability increases but the risk of insolvency also increases. So, the profitability and risk move in the same direction. What is required on the part of the financial manager is to maintain a balance between risk and profitability. Neither too much of risk nor too much of profitability is good. Example 12.2 explains the risk-return syndrome.

Example 12.2

The following is the balance sheet of ABC Ltd. as on 31st Dec. 2016.

BALANCE SHEET AS ON 31ST DEC. 2016

Liabilities	Amount	Assets	Amount
Share Capital	₹ 6,00,000	Fixed Assets	₹ 10,00,000
Debentures	5,00,000	Current Assets	2,00,000
Current liabilities	1,00,000		
	12,00,000		12,00,000

The firm is earning 12% return on fixed assets and 2% return on current assets. Find out the effect on liquidity and profitability of the firm of the following:

1. Increase in current assets by 25%.
2. Decrease in current assets by 25%.

Solution :

The present earnings of the firm may be ascertained as follows :

12% return on fixed assets	₹ 1,20,000
2% return on current assets	4,000
Total Return	1,24,000
Total Assets	₹ 12,00,000
Rate of return (Earnings/Total assets)	10.33%
Ratio of current assets to total assets (2,00,000/12,00,000)	16.7%

EVALUATION OF EFFECT ON LIQUIDITY AND PROFITABILITY :

	Present CA	Increase In CA	Decrease In CA
Current assets	₹ 2,00,000	₹ 2,50,000	₹ 1,50,000
Fixed assets	10,00,000	9,50,000	10,50,000
Return on fixed assets @ 12%	1,20,000	1,14,000	1,26,000
Return on current assets @ 2%	4,000	5,000	3,000
Total return	1,24,000	1,19,000	1,29,000
Ratio of CA to TA	16.7%	20.8%	12.5%
Current liabilities	1,00,000	1,00,000	1,00,000
Ratio of CA to CL	2	2.5	1.5
Return as a % of TA	10.33%	9.91%	10.75%

Example 12.2 shows that as the current assets are increased by 25% (from ₹ 2,00,000 to ₹ 2,50,000), the ratio of current assets to total assets also increases from 16.7% to 20.8%. The ratio of current assets to current liabilities also increases from 2 to 2.5 times indicating lesser risk of insolvency. However, with this increase, the overall earnings of the firm have reduced from ₹ 1,24,000 to ₹ 1,19,000 or from 10.33% to 9.91% of the total assets. Thus, if the firm opts to increase the current assets in order to increase the liquidity, the profitability of the firm also goes down.

In case, the firm opts to reduce the level of current assets by 25% from ₹ 2,00,000 to ₹ 1,50,000, the ratio of current assets to total assets will go down from 16.7% to 12.5% and the ratio of current assets to current liability will also go down to 1.5 times only. However, the profitability will increase from 10.33% to 10.75%.

Thus, Example 12.2 shows that the risk and return are opposite forces and the financial manager will have to find out a level of current assets where the risk as well as the return, both are optimum. The firm just cannot decrease the current assets to increase the profitability because it will result in increase of risk also. The firm should maintain the current assets at such a level at which both the risk and profitability are optimum.

Example 12.2 shows the effect of change in current assets on the risk and profitability of the firm. In the same way, the effect of change in current liabilities on the risk-return position of the firm can also be demonstrated. If the ratio of short term (current) liabilities to total liabilities increases, the firm's profitability will increase but the risk will also increase. The profitability will increase as a result of decrease in costs associated with using more of short term funds and less of long term funds. As the short term funds (current liabilities) are cheaper than the long term funds, the total cost will decrease resulting in higher profits. However, as the current liabilities increases, then the net working capital will also decrease (assuming current assets to be constant). The decrease in net working capital increases the overall risk.

Similarly, decrease in current liabilities will decrease the profitability of the firm as larger amount of financing will be raised using more and more of expensive long term sources of funds. However, there will be a corresponding decrease in risk also as the net working capital will increase as a result of decrease in current liabilities.

The combined effects of changes in current assets and in current liabilities can also be measured by considering them simultaneously. The effects of a decrease in ratio of current assets to total assets and the effects of increase in ratio of current liabilities to total liabilities can be measured simultaneously in the same way as shown in Example 12.2.

Moreover, the different elements of current assets should also be appropriately balanced. Each element and its position in the total working capital should be analyzed in the light of its characteristics. For example, the total current assets may be sufficient to cover the current liabilities but when the composition of current assets is analyzed, it may be found that it is consisting mainly of the obsolete and slow moving stock. This stock may not provide desired level of liquidity to pay off the current liabilities. Similarly, higher level of cash and bank balance may provide liquidity but affect the profitability because keeping cash and bank balance is not a profitable use of the resources.

Therefore, it can be said that the levels of the current assets and current liabilities have a bearing on the risk and profitability composition of the firm. A financial manager should balanced these effects and try to achieve a sound working capital structure of the firm.

TYPES OF WORKING CAPITAL NEEDS : Another important aspect of working capital management is to analyze the total working capital needs of the firm in order to find out the permanent and temporary working capital. It has already been discussed that the working capital is required because of existence of operating cycle. Moreover, the lengthier the operating cycle, greater would be the need for working capital. The operating cycle is a continuous process and therefore, the working capital is needed constantly and regularly. However, the magnitude and quantum of working capital required will not be same all the times, rather it will fluctuate.

The need for current assets tends to shift over time. Some of these changes reflect permanent changes in the firm as is the case when the inventory and receivables increase as the firm grows and the sales becomes higher and higher. Other changes are seasonal as is the case with increased inventory required for a particular festival season. Still others are random, reflecting the uncertainty associated with growth in sales due to firm specific or general economic factors. The working capital need therefore, can be bifurcated into permanent working capital and temporary working capital as follows :

1. **Permanent Working Capital:** There is always a minimum level of working capital which is continuously required by a firm in order to maintain its activities. Every firm must have a minimum of cash, stock and other current assets in order to meet its business requirements irrespective of the level of operations. Even during slack season, every firm maintains some current assets. This minimum level of current assets which must be maintained by any firm all the times, is known as permanent working capital for that firm. This amount of working capital is constantly and regularly required in the same way as fixed assets are required. So, it may also be called fixed working capital.
2. **Temporary Working Capital :** Over and above the permanent working capital, the firm may also require additional working capital in order to meet the requirements arising out of fluctuations in sales volume. This extra working capital needed to support the increased volume of sales is known as temporary or fluctuations working capital. For example, in case of spurt in sales, more stock must be maintained in order to meet the demand. This additional inventory may become excess when the normal sales level reappears after some time.

It may be noted that both the permanent working capital and temporary working capital are necessary for every firm and the financial manager must make a distinction between the two. The permanent working capital, once decided and arranged may not require regular attention or management as such. But care must be taken of the temporary working capital. The firm must be able to arrange additional working capital immediately whenever need arises. The temporary working capital is needed to meet the temporary liquidity requirements only. The distinction between permanent working capital and temporary working capital has been depicted in Figure 12.3.

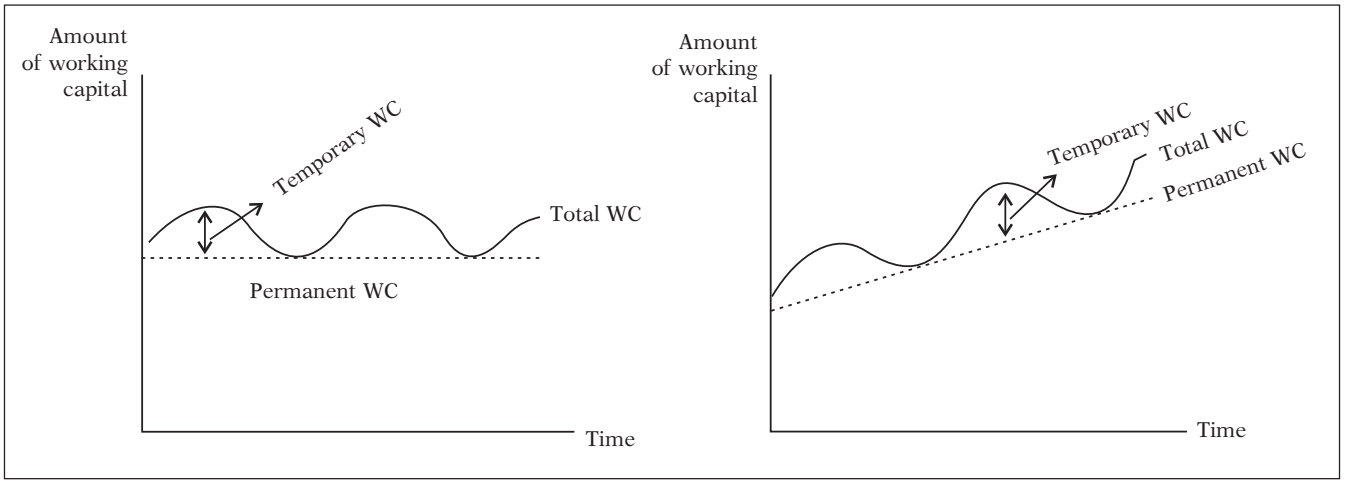

FIGURE 12.3 : PERMANENT AND TEMPORARY WORKING CAPITAL.

Figure 12.3 shows that the permanent working capital may either be constant over a period of time or may be increasing over a period of time. Further, that the permanent working capital is constant or increasing regularly while the temporary working capital is fluctuating from time to time. The bifurcation of total working capital into permanent and temporary components is relevant for the working capital policy decisions relating to financing of working capital needs. As discussed later, a financial manager has to decide about the financing of permanent and temporary working capital from different sources. Moreover, he is to arrange funds for investment in temporary working capital needs without loss of time. He is in fact, required to manage the total working capital needs in such a way as to keep available sufficient working capital to the firm as and when required.

FINANCING OF CURRENT ASSETS

Another important aspect of working capital management is to decide the pattern of financing the current assets and one of the major problem in working capital management is the decision whether to finance the working capital with one source or the other. The firm has to decide about the sources of funds which can be availed to make investment in current assets. Breaking down working capital needs into permanent and temporary components over time provides a useful by-product in terms of financing choice. The permanent component is predictable insofar as it is linked up to expected change in sales or cost of goods sales over time. The temporary component is also predictable in general as it follows the same pattern every year. So, the two components of working capital need to be financed accordingly for which the different sources of funds can be grouped as follows :

(*i*) ***Long-Term Sources*** which provide funds for a relatively longer period. Under this category the main sources are the share capital, retained earnings, debentures and long term borrowing.

(*ii*) ***Short-Term Sources*** which usually provide funds for a short period say up to one year or so. In this category, the main sources are bank credit, public deposit, commercial papers, factoring *etc.*

(*iii*) ***Transactionary Sources*** which provide funds to a business through the normal business operations e.g., credit allowed by suppliers and outstanding labour and other expenses. To the extent the firm delays or postpones the payments, the funds are available to it and that too generally at no cost. These are also called spontaneous sources of finance.

For example, as the firm acquires its inventories, the trade credit is often made available spontaneously or on demand, by the supplier. The trade credit varies directly with the firm's purchases of inventory items. In turn, the inventory purchases are related to the anticipated sales. Thus, a part of the financing needed by the firm is spontaneously provided in the form of trade credit. In addition, wages and salaries payable, accrued expenses, accrued interest and taxes also provide valuable sources of spontaneous financing.

It has been noted earlier that the net working capital is the excess of total current assets over total current liabilities. Thus, a part of total current assets is funded by current liabilities and only the remaining portion of current assets, known as net working capital, is to be arranged for. Therefore, the financial manager has to arrange funds for making investment in net working capital only. Different long term and

short term sources of funds are available to a firm and all these sources are different from one another with respect to their nature and characteristics. The working capital requirements of a firm can be financed by all or any combination of these sources.

It may be noted that both the permanent and temporary components are predictable yet they differ on at least one dimension *i.e.*, the permanent component of working capital is similar to an investment in fixed assets because it has to be replenished over time and thus requires financing for the long term. Consequently, it can be argued that this component should be financed with long term sources: either debt or equity or a combination of the two, depending upon the financing mix the firm chooses to use for financing long term assets. A part of permanent working capital may be financed by current liability also depending upon the trade-off between risk of having current liabilities and the cost associated with long term financing. The temporary component of working capital should be financed with pre-arranged lines of short term credit and the current liabilities. There are different approaches to take this decision relating to financing mix of the working capital as follows :

I-Hedging Approach (also known as Matching Approach) :

The Hedging Approach to working capital financing is based upon the concept of bifurcation of total working capital needs into permanent working capital and temporary working capital. As the name itself suggests, the life duration of current assets and the maturity period of the sources of funds are matched. The general rule is that the length of the finance should match with the life duration of the assets. That is why the fixed assets are always financed by long term sources only. So, the permanent working capital needs are financed by long term sources. On the other hand, the temporary working capital needs are financed by short term sources only. In other words, the core or fixed working capital is financed by long term sources of funds while the additional or fluctuating working capital needs are financed by the short term sources. The hedging approach to working capital financing has been shown in Figure 12.4.

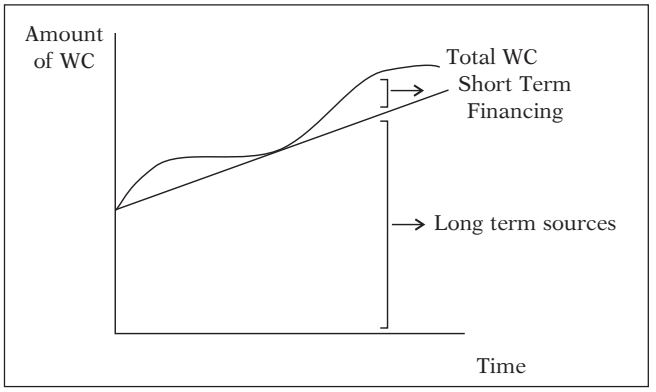

FIG.12.4 : THE HEDGING APPROACH TO WORKING CAPITAL FINANCING.

For example, a seasonal expansion in inventories should be financed with short term loan or liabilities. The rationale of the hedging principle is straight forward. Funds are needed for a limited period say for purchase of additional inventory, and when that period is over, the cash needed to repay the loan will be generated by the sale of extra inventory items. Obtaining the needed funds from a long term source would mean that the firm would still have the fund after the inventories had already been sold. In this case, the firm would have excess liquidity, which it either holds in cash or marketable securities until the seasonal increase in inventories occurs again. The result of all this would be to lower the profits of the firm.

The financing mix as suggested by the hedging approach is a desirable financing pattern. However, it may be noted that the exact matching of maturity period of current assets and sources of finance is always not possible because of uncertainty involved.

II- Conservative Approach : As the name itself suggests, under this approach the finance manager does not undertake risk. As a result, all the working capital needs are primarily financed by long term sources and the use of short term sources may be restricted to unexpected and emergency situation only. The working capital policy of a firm is called a conservative policy when all or most of the working capital needs are met by the long term sources and thus the firm avoids the risk of insolvency. The conservative approach to financing of working capital has been shown in Figure 12.5 and Figure 12.6.

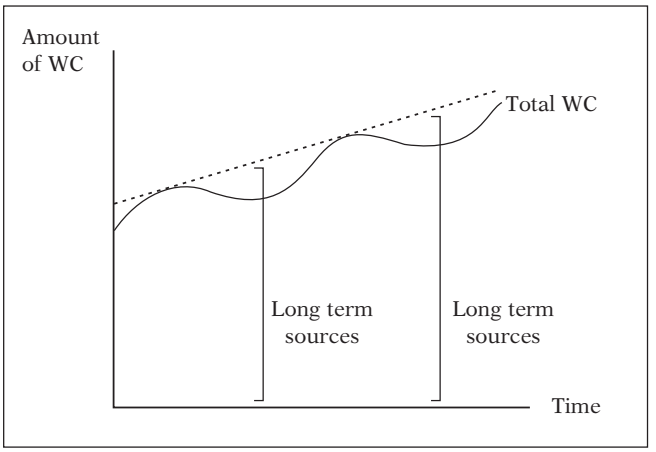

FIGURE 12.5 : FINANCING OF WORKING CAPITAL (CONSERVATIVE APPROACH)

So, under the conservative approach, the working capital is primarily financed by long term sources. The larger the portion of long term sources used for financing the working capital, the more conservative is said to be the working capital policy of the firm. In case, the firm has no temporary working

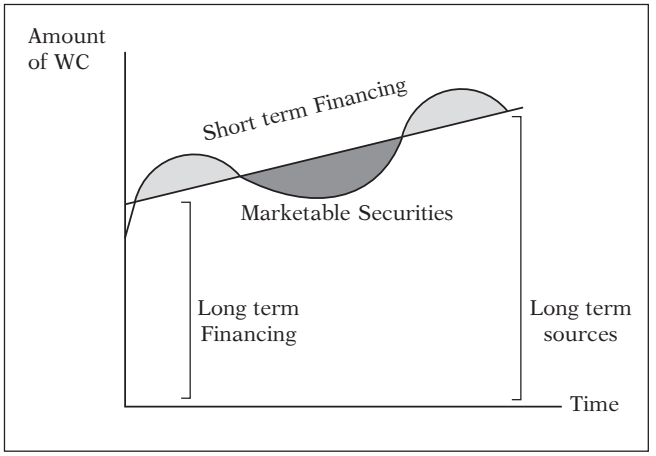

FIGURE 12.6 : FINANCING OF WORKING CAPITAL (CONSERVATIVE APPROACH)

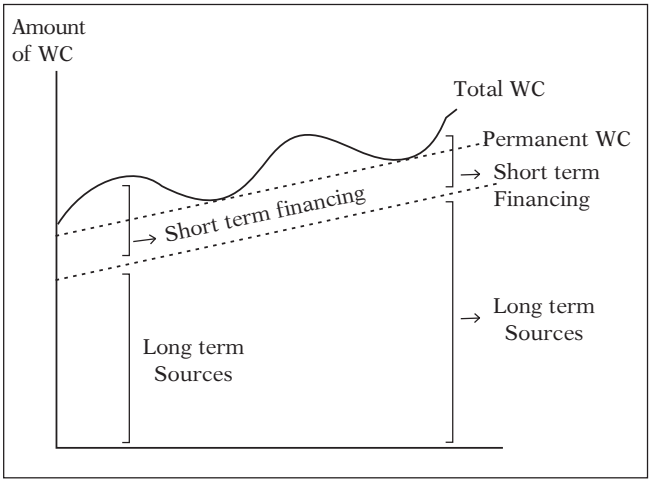

FIGURE 12.7 : AGGRESSIVE APPROACH TO FINANCING OF WORKING CAPITAL

capital need then the idle long term funds can be invested in marketable securities. This will help the firm to earn some income. Figure 12.6 shows that the firm uses a small amount of short term sources to meet its peak level working capital needs. It also stores liquidity in the form of marketable securities in slack season. The light shaded area in Figure 12.6 shows the use of short term financing for meeting the short term needs while the dark shaded shows the investment of excess funds in marketable securities.

III-Aggressive Approach : A working capital policy is called an aggressive policy if the firm decides to finance a part of the permanent working capital by short term sources. So, the short term financing under aggressive policy is more than the short term financing under the hedging approach. The aggressive policy seeks to minimize excess liquidity while meeting the short term requirements. The firm may accept even greater risk of insolvency in order to save cost of long term financing and thus in order to earn greater return. The aggressive approach to financing of working capital has been shown in Figure 12.7.

Hedging Approach (HA) *versus* Conservative Approach (CA) : The HA and CA are the two extreme approaches and do not help much the financial manager in managing the working capital needs. The HA is more risky as the short term (current) assets are financed by short term liabilities only and the firm may not have sufficient liquidity with it. On the other hand, the CA is more costly as the long term sources may remain idle in slack period. But, the CA is definitely less risky as more or less all the requirements of working capital needs are financed by long term sources.

The CA provides liquidity in excess of expected needs and thus minimizes the risk of (*i*) not being able to finance spontaneous assets growth, and (*ii*) defaulting on maturing/ obligations. Excess liquidity in the firm results in holding assets that are earning *nil* or an insignificant return. Thus, CA is a low risk-low return approach to working capital management. The comparative position of HA and CA with respect to working capital financing mix has been presented in Table 12.1.

TABLE 12.1 HEDGING *VERSUS* CONSERVATIVE APPROACH

		Hedging Approach		Conservative Approach
Advantages	**1.**	The cost of financing is reduced	**1.**	It is less risky and the firm is able to absorb shocks
	2.	The investment in net working capital is nil or minimum.	**2.**	The firm does not face frequent financing problems.
Disadvantages	**1.**	Frequent efforts are required to arrange funds.	**1.**	The cost of financing is definitely higher.
	2.	The risk is increased as the firm is vulnerable to sudden shocks.	**2.**	Large investment is blocked in temporary working capital.

Thus, the hedging approach suggests a low cost-high risk situation while the conservative approach attempts at high cost-low risk situation. Neither the hedging approach nor the conservative approach can be used by any firm in the strict sense. Therefore, the financial manager should try to have a trade-off between the hedging and conservative approach. Though, the trade-off between risk and profitability depends largely on the financial manager's attitude towards risk, yet while doing so he must take care of the following factors :

(*a*) ***Flexibility of the Mix*** **:** The financing mix of the working capital must be flexible enough. If the working capital needs are expected to be arising for a short period only then short-term sources should be used so that whenever the funds are released, they can be refunded. In such a situation, if the firm opts for long term sources, then the firm may not be able to refund even if it desires to refund and the pre-payment penalties may be prohibitory.

(*b*) ***Cost of Financing*** **:** The financial manager should also take into account the respective cost of financing from short term sources and long term sources. It is worth noting that it is not the rate of interest which is material, but the total cost of financing over a period of say one year, is relevant. For example, a firm has opportunity of raising funds by the issue of 14% debentures (7 years) or by taking a working capital term loan @ 18%. In this case, the rate of interest on long term source (*i.e.,* 14% on 7 years debentures) is lower but it does not mean that the firm should go only for long term sources. The financial manager should also find out the annual cost of financing. In case of debenture issue, interest for full year would be payable while in case of short term bank loan, interest at the rate of 18% would be payable only for the period for which the bank loan facility is availed. It is quite likely that the total interest payable on bank loan in a year may be much lower than the annual cost of interest on debenture.

(*c*) ***Risk Attached with Financing Mix :*** It is already noted that the short term financing is more risky. If the firm opts for short term sources to finance the current assets, then it may have to renew the borrowing at the end of each maturity. Moreover, the total cost of financing may fluctuate from one period to another depending upon the short term interest rates. But in case of long term financing, there is no risk regarding the cost of financing and renewals.

Conservative Approach *versus* Aggressive Approach : Unlike the aggressive approach, the conservative approach requires the firm to pay interest on unneeded funds. The lower cost of the aggressive approach, therefore, makes it more profitable than the conservative approach, but the former is much more risky. The contrast between these two approaches should clearly indicate the trade-off between profitability and risk. The aggressive approach provides high points but also high risk, while the conservative approach provides low profits and low risk. A trade-off between these two extremes should result in an acceptable financing strategy for most of the firms.

Risk-Return Trade-off : The financing of current assets involves a trade off between risk and return. A firm can choose from short or long-term sources of finance. Short-term financing is less expensive than long-term financing but at the same time, short-term financing involves greater risk than long-term financing. Depending on the mix of short-term and long-term financing, the approach followed by a company may be referred as matching approach, conservative approach and aggressive approach. It matching approach, long-term finance is used to finance fixed assets and permanent current assets, and short-term financing is used to finance temporary or variable current assets. Under the conservative plan, the firm finances its permanent assets and also a part of temporary current assets with long-term financing and hence less risk of facing the problem of shortage of funds.

An aggressive policy is said to be followed by the firm when it uses more short-term financing than warranted by the matching plan and finances a part of its permanent current assets with short-term financing. The discussion regarding the financing pattern of current assets point out a conflict between the short term and long term sources of finance. This conflict between the two arises because of fact that these sources have (*i*) different cost of financing, and (*ii*) different risk associated with them. A financial manager should therefore, strive for a trade-off between the risk and return associated with the financing mix. Such risk-return trade-off has been shown in Figure 12.8.

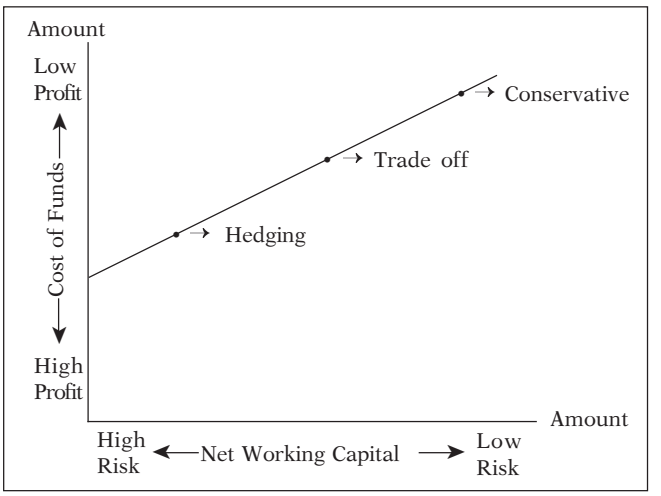

FIG. 12.8 : THE RISK-RETURN TRADE-OFF AND FINANCING MIX.

Figure 12.8 shows that the hedging approach results in a low costs-high risk situation while the conservative approach results in a high cost-low risk situation. The trade a off between risk and return give a financing mix that lies between these two extremes. For this purposes, the risk and return associated with different financing mix can be analyzed and accordingly a decision can be taken up. One way of achieving a trade-off is to find out, in the first instance, the average working capital required (on the basis of minimum and maximum during a period). Then this average working capital may be financed by long term sources and other requirements if any, arising from time to time may be met from short term sources. For example, a firm may require a minimum and maximum working capital of ₹ 10,000 and ₹ 18,000 respectively during a particular year. The firm have long term sources of ₹ 14,000 (*i.e.,* average of ₹ 10,000 and ₹ 18,000) and additional requirements over and above ₹ 14,000 may be met out of short term sources as and when the need arises.

OPTIMAL WORKING CAPITAL POLICY : Given the trade-off between the effects of increasing working capital and the

effects of reducing liquidity risk, it can be argued that working capital should be increased if and only if the benefits exceeds the costs. To put it differently, there is correlation between the firm value and the level of working capital investment. At least initially, increase in working capital may lead to increase in firms value, because the marginal benefits are likely to exceed the costs. At some level of working capital, holding all other factors constant, the firm's value should be maximized. This is the optimum level of working capital for the firm. In general, the working capital as a measure of liquidity risk suggests that increasing working capital will generally, reduce the liquidity risk faced by the firm, whereas decreasing the working capital will generally increase the liquidity risk. The effects of working capital changes on the liquidity risk depend on a number of factor such as :

(*a*) **Stand-by sources** : A firm with stand-by sources of external financing is less exposed to liquidity risk than the firm which does not have such access, because the former can tap these sources if it needs to cover the increasing current liabilities.

(*b*) **Economic Conditions** : Holding other factors constant, firms typically experience larger changes in liquidity risk as a consequence of working capital change when the economy is in recession than when it is in boom.

(*c*) **Future Uncertainty** : To the extent that future operations of the firm are predictable and stable, the firm can survive with lower investment in working capital than could, otherwise similar firms which have more uncertainty about the future operations.

Therefore, the working capital policy adopted by a firm should be framed after due consideration of a host of factors. It would be better if the working capital policy is viewed and framed in terms of separate assets and liabilities policies. A conservative firm will tend to have conservative policies for both the current assets and the current liabilities, while an aggressive firm will tend to have aggressive policy for both the current assets and the current liabilities. In fact, a firm should strive for an overall optimal working capital policy for which the following points are worth noting:

(*i*) Individual current assets and current liabilities policies should be framed so as to reduce or avoid larger degree of risk in any such policy,

(*ii*) One aggressive policy may be off-set by an other conservative policy. For example, a firm may have a conservative policy for current assets but aggressive policy for current liabilities. The overall result will tend to be moderate working capital policy for the firm. Such a moderate policy will be optimal working capital policy for the firm. This will help in maximizing the value of the firm for the level of risk assumed by the firm.

WORKING CAPITAL : MONITORING AND CONTROL

It goes without saying that the working capital quantum as well as its financing pattern are subject to constant monitoring and review by the financial manager, care must be taken that the working capital structure remains as intended to be. There are different analytical tools which can help a financial manager in monitoring, reviewing and controlling the working capital, some of which are as follows :

1. **Monitoring the Operating Cycle :** It is already noted that the total working capital need depends upon the length of the operating cycle. The lengthier the operating cycle, the greater would be the working capital need. The operating cycle of a firm is consisting of different cycles for different elements of working capital. Therefore, the financial manager must monitor the duration of all these individual operating cycles for different elements in order to effectively control the working capital. The following points are worth noting here :

   (*a*) The actual operating cycle period should be ascertained for each element *i.e.*, the raw materials, the work-in-progress, the finished goods, the receivables *etc.* over a period of time and should be compared with the standard operating cycle period set for the same firm or for the industry as a whole. Efforts should also be made to point out the reasons for differences in the actual operating cycle period and the standard operating cycle period.

   (*b*) There should always be an attempt to reduce the length of the operating cycle, total as well as for each element. The standard operating cycle period need not be lowered but the actual operating cycle period must be kept as low as possible. This makes the firm have comfortable liquidity.

   (*c*) Efforts in particular, are needed to control the Receivables Conversion Period. If the firm relaxes in collection, the customer will always like to take liberty.

2. **Working Capital Ratios :** Another analytical tool that can be used to monitor the working capital is the accounting ratios, particularly the working capital ratios. For this purpose, the following working capital ratios may be noted.

   (*i*) Current Ratio *i.e.*, Current Assets to Current Liabilities Ratio,

   (*ii*) Liquid Ratio *i.e.*, Quick Assets to Current Liabilities Ratio,

   (*iii*) Current Assets to Total Assets Ratio,

   (*iv*) Current Assets to Total Sales Ratio.

These ratios may be ascertained for a number of years to find out the emerging working capital position of the firm. It may be noted that the Current Ratio is the most important one and it indicates the position of net working capital also. If the Current Ratio is more than 1, then the net working capital is positive. If the Current Ratio is 1, then the current assets are just equal to current liability and there is no net working capital. Further, if the Current Ratio is less than 1, then the current assets are less than the current liabilities and the firm has negative net working capital.

The Current Ratio as well as the Quick Ratio, both indicate the liquidity position of the firm *vis-a-vis* the current liabilities.

However, the Quick Ratio is supposed to give a better indication of the liquidity since it excludes the stock which may not be immediately realizable. The standard form of Current Ratio and Quick Ratio is taken as 2:1 and 1:1 respectively.

3. **Monitoring the Liquidity :** Although, profitability and selection of goods investment are the keys to the prosperity of the firm in the long run, yet it is the liquidity which ensures the short term survival of the firm. Sufficient liquidity can be obtained by efficient management of different elements of working capital. If a firm faces liquidity problems, then it must be realized that this liquidity problem arises from lack of finance. The liquidity problem can be overcome in two ways (*i*) to raise additional funds from different sources. But this may not always be possible for the firm, and (*ii*) the following steps may be taken by the firm to ease the liquidity problem :

   (*a*) Reduce the safety stock, resulting in reduction of order size. This reduction in order size however, will have many repercussions such as more frequent and costly orders, loss of quantity discount, probability of stock-out *etc.*, and therefore, must be decided very carefully.

   (*b*) Another way of improving the liquidity may be to delay the payments to the creditors but this is not possible without impairing the goodwill of the firm.

   (*c*) Liquidity can also be improved by concentrating more on collections of receivables. More effective control system should be introduced and the customers may be offered incentive for prompt payments. An improvement in collections definitely improves liquidity but it has a cost in terms of a possibility of a loss of customer. This aspect has been discussed in detail in Chapter 14.

POINTS TO REMEMBER

- The term working capital may be used to denote either the gross working capital which refers to total current assets or net working capital which refers to excess of current assets over current liabilities.
- The working capital requirement for a firm depends upon several factors such as operating cycle, nature of business, business cycle fluctuations, seasonally of operations, market competitiveness, credit policy, supply conditions *etc.*
- The operating cycle of a firm may be defined as the period from the procurement of raw materials goods to the realization of sales proceeds. It is consisting of the Inventory Conversion Period (ICT) and the Receivables Conversion Period (RCP). If the firm is receiving credit from the supplier of raw material/goods, then the Deferral Period (DP) may be deducted to find out the Net Operating Cycle (NOC).

$$NOC = ICP + RCP - DP$$

- Working capital management requires a trade off between liquidity and profitability. It may also be described as Risk-Return trade off.
- The working capital need of the firm may be bifurcated into Permanent and Temporary working capital.
- The Hedging Approach says that permanent requirement should be financed by long term sources while the temporary requirement should be financed by short term sources of finance.
- The Conservative Approach, on the other hand, says that the working capital requirement be financed primerly from the long term sources.
- The Aggressive Approach says that even a part of permanent requirement may be financed out of short term funds.
- Every firm must monitor the working capital position and for this purpose certain accounting ratios may be calculated.

GRADED ILLUSTRATIONS

Illustration 12.1

Using the following data, calculate the current working capital cycle for XYZ Ltd.

	(₹ in '000)
Sales	3,000
Cost of Production	2,100
Purchases	600
Average Raw material stock	80
Average Work-in-progress	85
Average Finished goods stock	180
Average Creditors	90
Average Debtors	350

Solution :

Operating cycle of XYZ Ltd.

1. **Raw material:** $= \frac{\text{Average Raw Material}}{\text{Total Raw Material}} \times 365 = \frac{80}{600} \times 365 = 49 \text{ days}$

2. **Work-in-progress:** $= \frac{\text{Average Work in progress}}{\text{Total Cost of Production}} \times 365 = \frac{85}{2,100} \times 365 = 15 \text{ days}$

3. **Finished goods:** $= \frac{\text{Avarage Stock}}{\text{Total Cost of Production}} \times 365 = \frac{180}{2,100} \times 365 = 31$ days

4. **Debtors:** $= \frac{\text{Average Debtors}}{\text{Total Credit Sales}} \times 365 = \frac{350}{3,000} \times 365 = 43$ Days

5. **Creditors:** $= \frac{\text{Avarage Creditors}}{\text{Total Purchases}} \times 365 = \frac{90}{600} \times 365 = 55$ days

Net Operating Cycle = 49 days + 15 days + 31 days – 43 days – 55 days
= 138 days – 55 days = 83 days.

Illustration 12.2

(*a*) The relevant information for XYZ Ltd. for the year is given below:

Sales : ₹ 80,000

Cost of Goods Sold : ₹ 56,000

	Opening	Closing
Inventory	₹ 9,000	₹ 12,000
Accounts Receivables	12,000	16,000
Accounts Payables	7,000	10,000

What is the length of Net Operating Cycle: Assume 365 days in a year. *[B.Com. (H.) D.U., 2010]*

Solution :

Inventory Operating Cycle :

$$= \frac{\text{Average Inventory -}}{\text{Average Cost of Goods Sold}} \times 365$$

$$= \frac{(9,000 + 12,000)/2}{56,000} \times 365 = 68 \text{ days}$$

$$\text{Receivable Operating Cycle} = \frac{\text{Average Receivables}}{\text{Annual Credit Sales}} \times 365$$

$$= \frac{(12,000+16,000)/2}{80,000} \times 365 = 64 \text{ days}$$

$$\text{Payables Operating Cycle} = \frac{\text{Average Payables}}{\text{Total Purchases}} \times 365$$

$$= \frac{(7,000+10,000)/2}{56,000} \times 365 = 55 \text{ days}$$

Net Operating Cycle = 68 + 64 – 55 = 77 days

Illustration 12.2

Satyam Sundaram Ltd.'s Profit and Loss A/c and Balance Sheet for the year ended 31.12.2016 are given below. You are required to calculate the working capital requirement under operating cycle method :

TRADING AND PROFIT AND LOSS ACCOUNT
for the year ended 31.12.2016

Particulars	Amount	Particulars	Amount
To Opening Stock :		By Credit Sales	₹ 1,00,000
Raw Materials	₹ 10,000	By Closing Stock:	
Work-in-progress	30,000	Raw Materials	11,000
Finished Goods	5,000	Work-in-progress	30,500
To Credit Purchase	35,000	Finished Goods	8,500
To Wages & Manufacturing exp.	15,000		
To Gross profit c/d	55,000		
	1,50,000		1,50,000
To Administrative exp.	15,000	By Gross profit b/d	55,000
To Selling and Dist. exp.	10,000		
To Net Profit	30,000		
	55,000		55,000

BALANCE SHEET
as at 31.12.2016

Liabilities	Amount	Assets	Amount
Share Capital (16,000 equity		Fixed assets	₹ 1,00,000
share of ₹ 10 each)	₹ 1,60,000	*Closing Stock:*	
Profit and Loss Account	30,000	Raw Materials	11,000
Creditors	10,000	Work in progress	30,500
		Finished Goods	8,500
		Debtors	30,500
		Cash and Bank	19,500
	2,00,000		2,00,000

Opening debtors and Opening creditors were ₹ 6,500 and ₹ 5,000, respectively.

Solution :

Calculation of Operating cycle:

1. Raw material

$$= \frac{\text{Average Raw Material}}{\text{Raw Material consumed}} \times 365 = \frac{10,500}{34,000} \times 365 = 113 \text{ days}$$

where, Average Raw Material = (10,000 + 11,000)/2 = 10,500

Raw material consumed = 10,000 + 35,000 – 11,000 = 34,000

2. Work-in-progress

$$= \frac{\text{Average Work-in-progress}}{\text{Total Cost of Production}} \times 365 = \frac{30,250}{48,500} \times 365 = 228 \text{ days}$$

where, Average Work-in-progress = (30,000 + 30,500)/2 = 30,250

Total Cost of Production = 30,000 + 34,000 + 15,000 – 30,500

= 48,500

3. Finished Goods

$$= \frac{\text{Average Stock}}{\text{Total Cost of Goods Sold}} \times 365 = \frac{6,750}{60,000} \times 365 = 41 \text{ days}$$

where, Average Stock = (5,000 + 8,500)/2 = 6,750

Total Cost of Goods Sold = 5,000+48,500 – 8,500 + 15,000 = 60,000

4. Debtors

$$= \frac{\text{Average Debtors}}{\text{Credit Sales}} \times 365 = \frac{18,500}{1,00,000} \times 365 = 67 \text{ days}$$

where, Average Debtors = (6,500 + 30,500)/2 = 18,500

Credit Sales = ₹ 1,00,000 (Given)

5. Creditors

$$= \frac{\text{Average Creditors}}{\text{Credit Purchases}} \times 365 = \frac{7,500}{35,000} \times 365 = 78 \text{ days}$$

where, Average Creditors = (5,000 + 10,000)/2 = 7,500

Credit Purchases = ₹ 35,000 (Given)

Net Operating Cycle is:

= Total Days – Credit allowed by Creditors

= 113 days + 228 days + 41 days + 67 days = 78 days

= 371 Days

Administrative expenses have not been considered for calculation of work in progress cycle but have been considered for finished goods cycle.

Illustration 12.4

From the following data, compute the duration of the operating cycle for each of the two years and comment on the increase/decrease :

	Year 1	Year 2
Stock :		
Raw Materials	20,000	27,000
Work-in-progress	14,000	18,000
Finished Goods	21,000	24,000
Purchases	96,000	1,35,000
Cost of Goods Sold	1,40,000	1,80,000
Sales	1,60,000	2,00,000
Debtors	32,000	50,000
Creditors	16,000	18,000

Assume 360 days per year for computational purposes.

[B.Com. (H.), D.U., 2014]

Solution :

(*a*) Calculation of Operating Cycle:

	Year 1	Year 2
1. **Raw Material Stock** (Average Raw material/Total Purchase) × 360	20/96 × 360 = 75 days	27/135 × 360 = 72 days
2. **Creditors period** (Average Creditor/Total Purchase) × 360	16/96 × 360 = – 60 days	18/135 × 360 = – 48 days
3. **Work-in-progress** (Average Work-in-progress/Total cost of goods sold) × 360	14/140 × 360 = 36 days	18/180 × 360 = 36 days
4. **Finished Goods** (Average Finished goods/Total cost of goods sold) × 360	21/140 × 360 = 54 days	24/180 × 360 = 48 days
5. **Debtors** (Average Debtors/Total Sales) × 360	32/160 × 360 = 72 days	50/200 × 360 = 90 days
Net operating cycle	177 days	198 days

There is an increase in length of operating cycle by 21 days *i.e.,* 12% increase approximately. Reasons for increase are as follows :

Debtors taking longer time to pay (90 – 72)	18 days
Creditors receiving payment earlier (60 – 48)	12 days
	30 days
–Finished Goods turnover lowered (54 – 48)	6 days
–Raw Material stock turnover lowered (75 – 72)	3 days
Increase in Operating Cycle	21 days

Illustration 12.5

Following Annexer information is collected from the record of Sunder Manufacturing Ltd. :

Cost of Goods Sold	₹ 8,00,000
Cost of Production	500,000
Raw Material consumed during the year	6,00,000
Average Finished Goods	40,000
Average Work-in-Process	30,000
Average Raw Material	50,000
Debtors collection period	45 days
Creditors payment period	30 days

Find out the Operating Cycle. How many operating cycles does the firm have in a year (360 days)?

Solution :

Calculation of Net Operating Cycle :

1.	Finished Goods :	$\frac{\text{Average Stock}}{\text{Cost of Goods Sold}} \times 360 = \frac{40,000}{8,00,000} \times 360$	= 18 days
2.	Work in Process :	$\frac{\text{Average Work in Process}}{\text{Cost of Production}} \times 360 = \frac{30,000}{5,00,000} \times 360$	= 22 days
3.	Raw Material :	$\frac{\text{Average RM Stock}}{\text{RM Consumed}} \times 360 = \frac{50,000}{6,00,000} \times 360$	= 30 days
4.	Debtors Collection Period		45 days
	Gross Operating Cycle		115 days
	–Creditors Payment Period :		30 days
	Net Operating Cycle		85 days
	No. of Operating Cycles in a year (360 ÷ 85)		4.2

There are 4.2 cycles of 85 days each in one year.

Illustration 12.6

XYZ Ltd. has obtained the following data concerning the average working capital cycle for other companies in the same industry :

Raw Material stock turnover	20 Days
Credit received	–40 Days
Work-in-progress turnover	15 Days
Finished Goods stock turnover	40 Days
Debtor's collection period	60 Days
	95 Days

Using the following data, calculate the current working capital cycle for XYZ Ltd. and briefly comment on it.

	(₹ in '000)
Sales (all credit)	6,000
Cost of Production	4,200
Purchases (all credit)	1,200
Average Raw Material stock	190
Average Work-in-progress	170
Average Finished Goods stock	360
Average Creditors	150
Average Debtors	700

Solution :

Operating cycle of XYZ Ltd.

1.	**Raw Material**	$= \frac{\text{Average Raw Material}}{\text{Total Raw Material}} \times 365 = \frac{190}{1,200} \times 365 = 58$ Days
2.	**Work-in-progress**	$= \frac{\text{Average Work in progress}}{\text{Total Cost of Production}} \times 365 = \frac{170}{4,200} \times 365 = 15$ Days
3.	**Finished Goods**	$= \frac{\text{Average Stock}}{\text{Total Cost of Production}} \times 365 = \frac{360}{4,200} \times 365 = 31$ Days
4.	**Debtors**	$= \frac{\text{Average Debtors}}{\text{Total Credit Sales}} \times 365 = \frac{700}{6,000} \times 365 = 43$ Days
5.	**Creditors**	$= \frac{\text{Average Creditors}}{\text{Total Purchases}} \times 365 = \frac{150}{1,200} \times 365 = 46$ Days
	Net Operating Cycle	= 58 days + 15 days + 31 days + 43 days – 46 days
		= 147 Days – 46 Days = 101 Days.

Comments : For XYZ Ltd., the working capital cycle is below the industry average, including a lower investment in net current assets. However, the following points should be noted about the individual elements of working capital.

(*a*) The stock of raw materials is considerably higher than average. So there is a need for stock control procedures to be reviewed.

(*b*) The value of creditors is also above average; this indicates that XYZ Ltd. is delaying the payment of creditors beyond the credit period. Although this is an additional source of finance, it may result in a higher cost of raw materials or loss of goodwill among the suppliers.

(*c*) The finished goods stock is below average. This may be due to a high demand for the firm's goods or to efficient stock control. A low finished goods stock can, however, reduce sales since it can cause delivery delays.

(*d*) The debts are collected more quickly than average. The company might have employed goods credit control procedures or offer cash discounts for early payment.

OBJECTIVE TYPE QUESTIONS

State whether each of the following statements is ***True (T)*** or ***False (F).***

(*i*) The level of working capital does not affect the smooth working of a firm.

(*ii*) Same principles and considerations are involved in the management of fixed assets as well as current assets.

(*iii*) Management of working capital deals with the short term liquidity position of the firm.

(*iv*) The operating cycle is equal to the total manufacturing period in a firm.

(*v*) Receivables conversion period begins when cash sales are effected.

(*vi*) Deferral period refers to credit period allowed by a firm to its customers.

(*vii*) In working capital management, time value of money has no relevance.

(*viii*) Working capital management stresses the risk-return trade off.

(*ix*) In Hedging approach, the permanent working capital is financed partly from long term sources.

(*x*) In Conservative approach, there is no long term financing of working capital.

[**Answers :** *(i) F, (ii) F, (iii) T, (iv) T, (v) F, (vi) F, (vii) T, (viii) T, (ix) F, (x) F*]

MULTIPLE CHOICE QUESTIONS

1. Management of working capital implies trade-off between :
- (*a*) Cost and Revenue
- (*b*) Assets and Liabilities
- (*c*) Debtors and Creditors
- (*d*) Liquidity and Profitability

2. Gross Working Capital is equal to :
- (*a*) Total Assets
- (*b*) Total Liabilities
- (*c*) Total Current Assets
- (*d*) Total Current Liabilities

3. Permanent Working Capital is also known as :
- (*a*) Gross Working Capital
- (*b*) Net Working Capital
- (*c*) Total Current Asset
- (*d*) None of the above.

4. Hedging Approach to Working Capital deals with :
- (*a*) Financing of CA
- (*b*) Financing of CL
- (*c*) Level of CA
- (*d*) Level of CL

5. In which of the following, the permanent working capital is financed by long-term sources of funds?
- (*a*) Hedging Approach
- (*b*) Aggressive Approach
- (*c*) Conservative Approach
- (*d*) All of the above.

6. Negative Net Working Capital implies that :
- (*a*) Long-term funds have been used for long-term assets
- (*b*) Long-term funds have been used for current assets
- (*c*) Short-term funds have been used for fixed assets
- (*d*) Short-term funds have been used for current assets.

7. Positive Net Working Capital implies that :
- (*a*) Liquidity position is not comfortable
- (*b*) Current Ratio is less than one
- (*c*) Current Assets are partly financed out of long-term sources
- (*d*) All of the above.

8. Operating cycle of a firm can be shortened by
   (*a*) Increasing credit period to customers
   (*b*) Increasing stock of raw material
   (*c*) Increasing working-in-progress period
   (*d*) Increasing credit period from suppliers.
9. Which of the following does not usually affect working capital requirement ?
   (*a*) Operating leverage
   (*b*) Financial leverage
   (*c*) Both of (*a*) and (*b*)
   (*d*) None of (*a*) and (*b*)
10. Which of the following is not a feature of current assets?
   (*a*) Shorter liquidity
   (*b*) Longer life
   (*c*) Controllable
   (*d*) Relevant
11. Net Operating Cycle is equal to :
   (*a*) GOC – DP
   (*b*) GOC + DP
   (*c*) RMCP + RCP
   (*d*) RMCP – RCP
12. Net Operating Cycle increases if :
   (*a*) More raw materials are purchased
   (*b*) Payment to creditors is made earlier
   (*c*) Goods are sold in shorter period
   (*d*) Both (*a*) and (*b*).
13. Find out the Cash Conversion Period if Receivable Conversion Period is 40 days, Deferral Period in 30 days and Inventory Holding Period in 25 days :
   (*a*) 30 days
   (*b*) 25 days
   (*c*) 35 days
   (*d*) 45 days
14. Which of the following is a determinant of working capital ?
   (*a*) Production Schedule
   (*b*) Production Capacity
   (*c*) Depreciation Policy
   (*d*) Tax Policy
15. Gross operating cycle is defined as :
   (*a*) Equal to accounting period
   (*b*) One calendar year
   (*c*) Either of (*a*) or (*b*)
   (*d*) None of (*a*) and (*b*)
16. Management of Working Capital deals with :
   (*a*) Short-term Liquidity,
   (*b*) Long-term Liquidity,
   (*c*) Cash Balance,
   (*d*) Issue of Share capital.
17. Which of the following is not included in Operating Cycle ?
   (*a*) Fixed Assets Level,
   (*b*) Raw Materials Stock,
   (*c*) Finished Goods Stock,
   (*d*) Creditors Payment Period.
18. Working Capital is defined as excess of :
   (*a*) Current Assets Over Capital,
   (*b*) Current Liabilities over Capital,
   (*c*) Current Assets over Current liabilities,
   (*d*) Share capital over Resources.
19. Deferral Period refers to the credit period allowed by :
   (*a*) Creditors,
   (*b*) Debtors,
   (*c*) Bank holders,
   (*d*) Shareholders.
20. Operating Cycle is a technique of :
   (*a*) Working Capital Management,
   (*b*) Receivables Management,
   (*c*) Inventory Management,
   (*d*) Creditors Management.
21. Operating Cycle is equal to Inventory Conversion Cycle Plus :
   (*a*) Receivable Conversion Period,
   (*b*) Creditors Deferral Period,
   (*c*) (*a*) Minus (*b*)
   (*d*) (*a*) Plus (*b*).
22. Permanent Working Capital :
   (*a*) Includes Fixed Assets,
   (*b*) Is minimum level of Current Assets,
   (*c*) Varies with seasonal pattern,
   (*d*) Includes Equity Capital.
23. Working Capital Management involves financing and management of
   (*a*) All Assets,
   (*b*) All Current Assets,
   (*c*) Cash and Bank Balance,
   (*d*) Receivables and Payables.
24. Which of the following is classified as Current Liability ?
   (*a*) Inventory,
   (*b*) Marketable Securities,
   (*c*) Provision for Tax,
   (*d*) Investments.

25. Current liabilities are those obligations which are generally to be discharged in :
   (*a*) 1 month,
   (*b*) 1 year,
   (*c*) 1 week,
   (*d*) 1 day.

[**Answers :** *1. (d), 2. (c), 3. (d), 4. (a), 5. (a), 6. (c), 7. (c), 8. (d), 9. (d), 10. (b), 11. (a), 12. (d), 13. (c), 14. (a), 15. (d), 16(a), 17(a), 18(c), 19(a), 20(a), 21(c), 22(b), 23(b), 24(c), 25(b)*]

ASSIGNMENTS

1. Write short notes on :
   — Adequacy of working capital.
   — Operating cycle concept. *[B.Com. (H.), D.U., 2014]*
   — Depreciation as a source of working capital.
2. State the areas which you consider would require the particular attention of the management for effective working capital management.
3. What do you mean by working capital management ? What are the elements of working capital management ?
4. Explain the importance of working capital management. What are the techniques that are used for planning and control of working capital ?
5. How would you assess the working capital requirements for seasonal industries ? What are the special considerations to be noted for?
6. Explain how working capital management policies affect the profitability liquidity for the firm.
7. What is the significance of working capital for a manufacturing firm ? What will be the consequences of shortage and excess of working capital ?
8. Explain and illustrate the profitability liquidity trade-off in working capital management.
9. Explain the factors having a bearing on working capital needs. [*B.Com.(H.), D.U., 2012, 2016*]
10. Should a firm finance its working capital requirements only with short term financing? If not, why?
11. Explain the risk-return trade-off of current assets financing. Do you recommend that current assets be financed entirely from short-term financing ? Give reasons.
12. Distinguish between the permanent and temporary working capital.
13. What are the different approaches to financing of working capital requirements ? *[B.Com. (H.), D.U., 2013]*
14. What is "Conservative Approach" to working capital financing ? How is it different from "Hedging Approach" ?
15. Is the "Aggressive approach" to working capital financing a good proposition ? What may be the consequences ?
16. "Liquidity and profitability are competing goals for the finance manager". Comment. *[B.Com. (H.), D.U., 2013]*
17. Explain the costs of liquidity and illiquidity.
18. "Length of operating cycle is the major determinant of working capital needs of a business firm." Explain.
19. "Merely increasing the working capital of the firm does not necessarily reduce the riskiness of the firm, rather the composition of current assets is equally important. Comment.
20. Working Capital Management deals with decisions regarding the appropriate mix of current assets and current liabilities. Elucidate.
21. What is management of working capital? State briefly the repercussions if a firm has :
   (*i*) Paucity of working capital.
   (*ii*) Excess of working capital.

   [B.Com. (H.), D.U., 2015]
22. Discuss various sources of working capital finance. *[B.Com. (H.), D.U., 2017]*

CHAPTER

13

Working Capital : Estimation and Calculation

"The fact that cash inflows are not matched in both timing and amount by cash outflows, provides us with an operating cycle and rationale for investing in working capital. In any analysis of working capital, a distinction is made between temporary and permanent working capital requirements. The latter are a function of secular and cyclical trends in sales and operating expenses. The former depend on seasonal factors. In a proforma projection of working capital requirements, management must forecast the maximum level of current assets required to support an expected volume of sales and maximum level of short term credit it can anticipate to finance these assets."[1]

SYNOPSIS

- Estimation Procedure.
- Working Capital as a Percentage of Net Sales.
- Working Capital as a Percentage of Total Assets.
- Working Capital Based on Operating Cycle.
  - Need for Cash and Bank Balance.
  - Need for Inventories.
  - Need for Receivables.
  - Provided by Creditors.
  - Provided by Outstanding Wages and Expenses.
- Estimation of Working Capital Requirement.
- Graded Illustrations in Working Capital Estimation.

1. Curran, W.S., *Principles of Financial Management.* McGraw-Hill Book Company, New York, First Edition, p. 161.

The preceding chapter has thrown light on various aspects of working capital planning, management and control. The efficiency of the planning and management is subject to the correct estimate of the working capital requirement. Irrespective of the planning exercise made and control mechanism adopted, the correct estimation of working capital requirement is the fundamental necessity of a good and efficient working capital management. The present chapter looks into the steps and calculations required to estimate the working capital requirement for a firm.

Estimation Process : A firm must estimate in advance as to how much net working capital will be required for the smooth operations of the business. Only then, it can bifurcate this requirement into permanent working capital and temporary working capital. This bifurcation will help in deciding the financing pattern *i.e.*, how much working capital should be financed from long term sources and how much be financed from short term sources. There are different approaches available to estimate the working capital requirements of a firm as follows :

1. **Working Capital as a Percentage of Net Sales :** This approach to estimate the working capital requirement is based on the fact that the working capital for any firm is directly related to the sales volume of that firm. So, the working capital requirement is expressed as a percentage of expected sales for a particular period. The working capital estimation is thus, solely dependent on the sales forecast. This approach is Based on the assumption that higher the sales level, the greater would be the need for working capital. There are three steps involved in the estimation of working capital.

(*a*) To estimate total current assets as a % of estimated net sales.

(*b*) To estimate current liabilities as a % of estimated net sales, and

(*c*) The difference between the two above, is the net working capital as a % of net sales.

So, the firm has to find out on the basis of past experience, or on the basis of other firm's experience in the same competitive environment, as to how much total current assets and total current liabilities should be maintained for a given level of expected sales. The step (*a*) above *i.e.*, total current assets as a % of net sales will give the gross working capital requirement and step (*b*) above *i.e.*, current liabilities as a % of net sales will give the funds provided by current liabilities. The difference between the two is the net working capital which the firm has to arrange for. For example, the following information is available for ABC Ltd. for past three years, on the basis of which the working capital requirement for the next year is to be estimated, given that the sales are expected to increase by 10% over sales level of current year.

	Year 1	Year 2	Year 3
Net Sales	₹ 10,00,000	₹ 12,00,000	₹ 14,00,000
Total Current Assets	2,00,000	2,52,000	3,08,000
Total Current Liabilities	50,000	60,000	70,000
Current Assets as a % of Sales	20%	21%	22%
Current Liabilities as a % of Sales	5%	5%	5%

In this case, the average of current assets as a % of sales is 21% *i.e.*, (20%+21%+22%)/3; and the average of current liabilities as a % of sales is 5%. So, the net working capital as a % of sales is 16% *i.e.*, 21%-5%. Now, if the firm expects an increase of 10% in sales next year, then its working capital requirement can be estimated as follows :

Expected Sales = ₹ 14,00,000 + 10% thereof
= ₹ 15,40,000.

Net working capital as a % of sales = 16%.
= ₹ 15,40,000 × 16% = ₹ 2,46,400.

The firm is expected to have gross working capital of ₹ 3,23,400 (*i.e.*, 21% of ₹ 15,40,000) out of which financing by current liabilities is expected to be ₹ 77,000 (*i.e.*, 5% of ₹ 15,40,000). It may be noted that in the above situation the simple arithmetic average of current assets and current liabilities as a % of sales have been taken. If there is a consistent trend (increase or decrease) in current assets or current liabilities or both, then the weighted average may be preferred.

2. **Working Capital as a Percentage of Total Assets or Fixed Assets :** This approach of estimation of working capital requirement is based on the fact that the total assets of the firm are consisting of fixed assets and current assets. On the basis of past experience, a relationship between (*i*) total current assets *i.e.*, gross working capital; or net working capital *i.e.*, Current assets - Current liabilities, and (*ii*) total fixed assets or total assets of the firm is established. For example, a firm is maintaining 20% of its total assets in the form of current assets and expects to have total assets of ₹ 50,00,000 next year. Thus, the current assets of the firm would be ₹ 10,00,000 (*i.e.*, 20% of ₹ 50,00,000).

In this approach, the working capital may also be estimated as a % of fixed assets. The firm basically plans the future level of fixed assets in terms of capital budgeting decisions. In order to use these fixed assets in an efficient and optimal way, the firm must have sufficient working capital. So, the working capital requirement depend upon the planned level of fixed assets. The estimation of working capital therefore, depends upon the estimation of fixed capital which depends upon the capital budgeting decisions. It has already been noted in Chapter 8 that the investment decisions of a firm are consisting of capital budgeting decisions (relating to fixed assets) and working capital management (relating to current assets and current liabilities). So, the working capital estimation, being a part of the investment decisions, should be made together with the capital budgeting decisions.

Both the above approaches to the estimation of working capital requirement are relatively simple in approach but difficult in calculation. The main shortcoming of these approaches is that these require to establish the relationship of current assets with the net sales or fixed assets, which is quite difficult. The past experience either may not be available, or even if available, may not help much in correct estimation. There is yet another approach to estimate the working capital requirement based on the concept of operating cycle.

3. **Working Capital based on Operating Cycle :** The concept of operating cycle, as discussed in the preceding chapter, helps determining the time scale over which the current assets are maintained. The operating cycle for different components of working capital gives the time for which an assets is maintained, once it is acquired. However, the concept of operating cycle does not talk of the funds invested in maintaining these current assets. The concept of operating cycle can definitely be used to estimate the working capital requirements for any firm.

In this approach, the working capital estimate depends upon the operating cycle of the firm. A detailed analysis is made for each component of working capital and estimation is made for each of these components. The different components of working capital may be enumerated as follows :

Current Assets	Current Liabilities
Cash and Bank Balance	Creditors for Purchases
Inventory of Raw Material	Creditors for Expenses
Inventory of Work-in-progress	
Inventory of Finished Goods	
Receivables	

Different components of current assets require funds depending upon the respective operating cycle and the cost involved. The current liabilities, on the other hand, provide financing depending upon the respective operating cycle or the lag period in payment. The estimation of working capital requirement can now be made as follows :

(*a*) **Need for Cash and Bank Balance :** Every firm must maintain some minimum cash and bank balance (*i.e.*, immediate liquidity) to meet day to day requirement for petty expenses, general expenses and even for cash purchases. The minimum cash requirement for these transactions can be estimated on the basis of past experience. The need or motives for holding cash and bank balance have been discussed in detail in the next chapter. However, it must be noted, at this stage that the cash and bank balance must be estimated correctly for two reasons : (*i*) That the cash and bank balance is the least productive of all the current assets, hence a minimum balance be maintained, and (*ii*) The cash and bank balance provide liquidity to the firm, which is of utmost importance to any firm. The minimum cash and bank balance is also considered while preparing the cash budget for the firm (Chapter 14).

(*b*) **Need for Raw Materials :** Every manufacturing firm has to maintain some stock of raw material in stores in order to meet the requirements of the production process. The number of units to be kept in stores for different types of raw materials depend upon various factors such as raw material consumption rate, time lag in procuring fresh stock, contingencies and other factors. For example, if it takes 5 days to procure fresh stock of raw materials, and 50 units are used daily, then there should be a minimum of 250 units in stock. The firm may also like to have a safety stock of 20 units. Thus, the total units to be maintained in stores would be 270 units. If the cost per unit of this item of raw material is ₹ 10 per unit, then the working capital requirement is ₹ 2,700 (*i.e.*, 270 × ₹ 10).

(*c*) **Need for Work-in-progress** : In any manufacturing firm, the production process is continuous and is generally consisting of several stages. At any particular point of time, there will be different number of units in different stages of production. Some of these units may be 10% complete, some may be 60% complete and some may be even 99% complete. These units, which can neither be defined as raw material nor as finished goods, are known as work-in-progress or semi-finished goods. The value of raw material, wages and other expenses locked up in these semi-finished units is the working capital requirement for work-in-progress.

It may be noted that all the units are not equally completed and hence valuation of all these units is a difficult job. For this purpose, certain assumptions may be made as follows :

(*i*) The production process starts with the intake of full raw material. So, the value of raw material locked up in work-in-progress will be equal to full cost of number of units of raw material being represented in work-in-progress.

(*ii*) The units in work-in-progress may be unfinished with respect to labour expenses and overhead expenses only. Some of these units may be 10% complete, some may be 75% complete and some may be even 80% complete and so on. It is assumed for simplification, that all work-in-progress units are on an average 50% complete with respect to labour and overhead expenses. However, if some other information is given, then the valuation of work-in-progress may be made accordingly.

(*d*) **Need for Finished Goods :** In most of the cases, be it a trading concern or a manufacturing concern, the goods are not immediately sold after purchase/procurement/completion of production process. The goods in fact, remain in stores for some times before they are sold. The cost which is already incurred in purchasing, procuring or production of these units is locked up and hence working capital is required for them. It may be noted that these finished goods are valued on the basis of cost of these units. The carriage inward ofcourse, is included.

(*e*) **Need for Receivables :** The term receivables include the debtors and the bills. When the goods are sold by a firm on cash basis, the sales revenue is realized immediately and no working capital is required for after sale period. However, in case of credit sales, there is a time lag between sales and collection of sales revenue. For example, a firm makes a credit sale of ₹ 1,50,000 per month and a credit of 15 days given to customers. The working capital locked up in receivables is ₹ 75,000 (₹ 1,50,000 × 1/2 month).

However, an important point is worth noting here. The calculation of ₹ 75,000 is based upon the selling price, whereas the actual funds locked up in receivables are

restricted to the cost of goods sold only. There is no investment in profit element as such. Therefore, it is better to calculate the working capital locked up in receivables on the cost basis. Thus, if the firm is selling goods at a gross profit of 20% then the working capital requirement in the above case, for receivables would be ₹ 60,000 only (*i.e.*, ₹ 75,000 × 80%).

The total of working capital requirement for all the above elements is also known as the gross working capital of the firm. At any particular point of time every firm requires this gross working capital as there will be some units of raw materials in stores, some units in work-in-progress, some units as finished goods and there will be some debtors yet to be collected.

(*f*) **Creditors for the Purchases :** Likewise a firm sells goods and services on credit it may procure/purchases raw materials and finished goods on credit basis. The payment for these purchases may be postponed for the period of credit allowed by suppliers. So, the suppliers of the firm in fact provide working capital to the firm for the credit period. For example, a firm makes credit purchases of ₹ 60,000 per month and the credit allowed by the suppliers is two month, then the working capital supplied by the creditors is ₹ 1,20,000 (*i.e.*, ₹ 60,000×2 months). It means that the firm would be getting the supplies without however, making the payment for two months. The postponement of the payment to the creditors makes the firm to utilize this money elsewhere or help the firm to sell on credit without blocking its own funds.

(*g*) **Creditors for Expenses and Wages :** Usually, the expenses and wages are paid at the end of a month. However, these wages and expenses accumulate in the work-in-progress and finished goods on a regular basis. The time lag in payment of wages and other expenses also provide some working capital to the firm. It may be noted that these wages and expenses are considered for the valuation of work-in-progress and finished goods, but are paid usually at the end of the month, providing a working capital to the firm for that period.

The working capital estimation as per the method of operating cycle, is the most systematic and logical approach. In this case, the working capital estimation is made on the basis of analysis of each and every component of the working capital individually. As already discussed, the working capital, required to sustain the level of planned operations, is determined by calculating all the individual components of current assets and current liabilities. There are different steps required for estimation of working capital based on operating cycle. These steps are :

(*i*) Identify the current assets and current liabilities to be maintained. Estimation of each element of current assets and current liability is required.

(*ii*) Determine the average operating cycle (or holding period) for each of these elements. Calculation of different holding periods has been explained in the previous chapter.

(*iii*) Find out the rate per unit for each of these elements. For example, the rates of raw materials, work in progress, finished goods are to be ascertained.

(*iv*) Find out the amount (funds) expected to be blocked in each of these elements. For example, in raw materials, the funds blocked are :

Av. holding period × No. of units required Per Period × Rate per unit.

(*v*) Prepare the working capital estimation sheet and find out the working capital requirement.

The work-sheet for estimation of working capital requirements under the operating cycle method may be presented as follows :

Estimation of Working Capital Requirements

I	Current Assets :	Amount	Amount	Amount
	Minimum Cash Balance		****	
	Inventories :			
	Raw Materials	****		
	Work-in-progress	****		
	Finished Goods	****	****	
	Receivables :			
	Debtors	****		
	Bills	****	****	
	Gross Working Capital (CA)		****	****
II.	**Current Liabilities :**			
	Creditors for Purchases		****	
	Creditors for Wages		****	
	Creditors for Overheads		****	
	Total Current Liabilities (CL)		****	****
	Excess of CA over CL			****
	+ Safety Margin			****
	Net Working Capital			****

The following points are also worth noting while estimating the working capital requirement :

1. **Depreciation :** An important point worth noting while estimating the working capital requirement is the depreciation on fixed assets. The depreciation on the fixed assets, which are used in the production process or other activities, is not considered in working capital estimation. The depreciation is a non-cash expense and there is no funds locked up in depreciation as such and therefore, it is ignored. Depreciation is neither included in valuation of work-in-progress nor in finished goods. The working capital calculated by ignoring depreciation is known as cash basis working capital. In case, depreciation is included in working capital calculations, such estimate is known as total basis working capital.
2. **Safety Margin :** Sometimes, a firm may also like to have a safety margin of working capital in order to meet any contingency. The safety margin may be expressed as a % of total current assets or total current liabilities or net working capital. The safety margin, if required, is incorporated in the working capital estimates to find out the net working capital required for the firm. There is no hard and fast rule about the quantum of safety margin and depends upon the nature and characteristics of the firm as well as of its current assets and current liabilities.

POINTS TO REMEMBER

- Every firm must estimate in advance as to how much net working capital will be required for the smooth operations of the business.
- Working capital estimates may be made on the basis of (*i*) As a % of net sales, (*ii*) As a % of total assets or fixed assets and (*iii*) operating cycle of the firm.
- In the operating cycle method, the working capital requirement is ascertained by finding out the need for cash, for raw materials, for work in progress, for finished goods and for debtors. However, if the credit is allowed by creditors or others then it is deducated to find out the net working capital requirement.
- At the work in progress stage, the three elements is RM, wages and expenses are estimated separately.
- Unless given otherwise, 100% RM is assumed to introduced in the production process in the beginning, but wages and expenses are assumed to accrue evenly throughout the production process.
- The requirement for finished goods and work in progress is taken at cash cost only and the amount of depreciation is ignored.
- The debtors (receivables) may be taken at cash cost or selling price. But it is better to take the debtors at cash cost because that shows the funds required for financing of working capital.
- While finding out the working capital requirement, the firm should also include a safety margin to take care of the contingencies.

GRADED ILLUSTRATIONS

Illustration 13.1

ABC Ltd. expects its cost of goods sold for 2000-2001 to be ₹ 600 lacs. The expected operating cycle is 90 days. It wants to keep a minimum cash balance of ₹ one lac. What is the expected working capital requirement? Assume a year consists of 360 days.

Solution :

Working Capital Requirement:

Cash balance = ₹ 1,00,000

Working Capital for Cost of goods sold $= \frac{600,00,000}{360} \times 90$

= ₹ 150,00,000

Total Working Capital = ₹ 151,00,000

Illustration 13.2

Find out the working capital requirement from the following information :

Production during the year	60,000 units
Selling Price	₹ 5 per unit.
Raw Material	60%
Wages	10%
Overheads	20%
Raw Material storage period	2 months
Work in process storage period	1 months
Finished goods storage period	3 months
Credit allowed by suppliers	2 months
Credit allowed to customers	3 months
Minimum cash balance desired	₹ 20,000
Wages and overheads payment	1 month

Solution:

Production per month	(60,000÷12)	5,000 units
Selling Price		₹ 5.00 per unit
Raw Material	(60%)	₹ 3.00 per unit
Wages	(10%)	₹ 0.50 per unit
Overheads	(20%)	₹ 1.00 per unit

ESTIMATION OF WORKING CAPITAL REQUIREMENT

I. Current Assets:		**Amount**	**Amount**
Cash Balance		₹ 20,000	
Raw Material	(5,000 × ₹ 3 × 2)	30,000	
Work in Process:			
Raw Material	(5000 × Rs 3 × 1)	15,000	
Wages	(5000 × ₹ 0.50 × 1)50%	1,250	
Overheads	(5,000 × ₹ 1 × 1)50%	2,500	
Finished good	(5000 × ₹ 4.50 × 3)	67,500	
Debtors	(5,000 × ₹ 4.50 × 3)	67,500	
Gross Working Capital		2,03,750	₹ 2,03,750

II. Current Liabilities :			
Creditors	(5,000 × ₹ 3 × 2)	30,000	
Wages	(5,000 × ₹ 0.50 × 1)	2,500	
Overheads	(5,000 × ₹ 1 × 1)	5,000	
Total Current Liabilities		37,500	37,500
Net Working Capital	(CA–CL)		1,66,250

Illustration 13.3

Prepare an estimate of networking capital requirement of Zero company from the data given below:

Estimated Cost per Unit of Production	Amount per Unit (₹)
Raw Materials	100
Direct Labour	40
Overheads	80
	220

The following is the additional information:

Selling price per unit	₹ 240
Level of activity	1,04,000 units per annum
Raw Materials in stock	average 4 weeks
Work in progress [Assume 100% stage of completion of materials and 50 per cent for labour and overheads]	average 2 weeks
Finished Goods in Stock	average 4 weeks
Credit allowed by Suppliers	average 4 weeks
Credit allowed to Debtors	average 8 weeks
Lag in payment of Wages	average 1 1/2 weeks.

Cash at Bank is expected to be ₹ 25,000. Assume that production is sustained during 52 weeks of the year.

Solution:

STATEMENT OF WORKING CAPITAL REQUIREMENT

A. Current Assets		**Amount (₹)**	**Amount (₹)**
Raw Materials	(2000 × 4 × 100)		8,00,000
Work in Progress			
Raw Material	(2000 × 2 × 100)	4,00,000	
Wages	(2000 × 2 × 40) 50%	80,000	
Overheads	(2000 × 2 × 80) 50%	1,60,000	6,40,000
Finished Stock	(2000 × 4 × 220)		17,60,000
Debtors	(2000 × 8 × 220)		35,20,000
Cash			25,000
Total Current Assets (CA)			67,45,000
B. Current Liabilities			
Creditors	(2000 × 4 × 100)		8,00,000
Outstanding Wages	(2000 × 40 × 1.5)		1,20,000
Total Current Liabilities (CL)			9,20,000
Net Working Capital (CA–CL)			58,25,000

Working Notes:

(*i*) Annual production is 1,04,000 units and year is consisting of 52 weeks. So, the weekly production is 2000 units.

(*ii*) Debtors have been taken at cost of production.

Average raw material in stock is for one month. Average material in work-in-progress is for half month. Credit allowed by suppliers: one month; credit allowed to debtors : one month. Average time lag in payment of wages: 10 days; average time lag in payment of overheads 30 days. 25% of the sales are on cash basis. Cash balance expected to be ₹ 1,00,000. Finished goods lie in the warehouse for one month.

You are required to prepare a statement of the working capital needed to finance a level of the activity of 54,000 units of output. Production is carried on evenly throughout the year and wages and overheads accrue similarly. State your assumptions, if any, clearly.

Solution :

As the annual level of activity is given at 54,000 units, it means that the monthly turnover would be 54,000/12 = 4,500 units.

Illustration 13.4

The cost sheet of PQR Ltd. provides the following data :

	Cost per unit
Raw material	₹ 50
Direct Labour	20
Overheads (including depreciation of ₹ 10)	40
Total cost	110
Profits	20
Selling price	130

The working capital requirement for this monthly turnover can now be estimated as follows :

Estimation of Working Capital Requirement

I. Current Assets :	Amount	Amount
Minimum Cash Balance	₹ 1,00.000	
Inventories :		
Raw Materials (4,500 × ₹50)	2,25,000	
Work-in-progress :		
Materials (4,500 × ₹50)/2	1,12,500	
Wages 50% of (4,500 × ₹20)/2	22,500	
Overheads 50% of (4,500 × ₹30)/2	33,750	
Finished Goods (4,500 × ₹ 100)	4,50,000	
Debtors (4,500 × ₹ 100 × 75%)	3,37,500	
Gross Working Capital	12,81,250	₹ 12,81,250
II. Current Liabilities :		
Creditors for Materials (4,500 × ₹ 50)	2,25,000	
Creditors for Wages (4,500 × ₹ 20)/3	30,000	
Creditors for Overheads (4,500 × ₹ 30)	1,35,000	
Total Current Liabilities	3,90,000	3,90,000
Net Working Capital		8,91,250

Working Notes :

1. The Overheads of ₹ 40 per unit include a depreciation of ₹ 10 per unit, which is a non-cash item. This depreciation cost has been ignored for valuation of work-in-progress, finished goods and debtors. The overhead cost, therefore, has been taken only at ₹ 30 per unit.
2. In the valuation of work-in-progress, the raw materials have been taken at full requirements for 15 days; but the wages and overheads have been taken only at 50% on the assumption that on an average all units in work-in-progress are 50% complete.
3. Since, the wages are paid with a time lag of 10 days, the working capital provided by wages has been taken by dividing the monthly wages by 3 (assuming a month to consist of 30 days).

Illustration 13.5

The following information has been extracted from the records of a Company : Product cost sheet

Raw Materials	₹ 45
Direct Labour	20
Overheads	40
Total	105
Profit	15
Selling price	120

- Raw materials are in stock on an average for two months.
- The materials are in process on an average for one month. The degree of completion is 50% in respect of all elements of cost.
- Finished goods stock on an average is for one month.
- Time lag in payment of wages and overheads is 1½ weeks.
- Time lag in receipt of proceeds from debtors is 2 months.
- Credit allowed by suppliers is one month.
- 20% of the output is sold against cash.
- The company expects to keep a Cash balance of ₹ 1,00,000.

The Company is poised for a manufacture of 1,44,000 units in the next year.

You are required to prepare a statement showing the Working Capital requirements of the Company

Solution :

Statement showing the Working Capital requirement of the Company

Current Assets :		
Stock of Raw Materials (12,000 × 2 × ₹ 45)	₹ 10,80,000	
Work-in-progress (12,000 × 1 × ₹ 105) × 50%	6,30,000	
Finished Goods (12,000 × 1 × ₹ 105)	12,60,000	
Debtors (12,000 × 2 × ₹ 105 × 80%)	20,16,000	
Cash balances	1,00,000	50,86,000
Current Liabilities :		
Creditors of Raw Materials (12,000 × 1 × ₹ 45)	5,40,000	
Creditors for Wages & Overheads (12,000 × 60 ÷ 4) 1.5	2,70,000	8,10,000
Net Working capital (C.A – C.L)		42,76,000

Working Notes :

1. Finished goods and Debtors have been taken at cost.
2. Production per month has been taken at 12,000 units. For payment of wages and overheads, month is taken as consisting of 4 weeks.

Illustration 13.6

XYZ Ltd. supplied the following information:

Sales and Production for the year	69,000 units
Finished Goods in Store	3 months
Raw Material in Store	2 months consumption
Production process	1 month
Credit allowed by Creditors	2 months
Selling Price per unit	₹ 50.00
Raw Material	50% of Selling Price
Direct Wages	10% of Selling Price
Overheads	20% of Selling Price

20% Sales are on cash basis and credit sales allowed to customers for one month. Overheads include ₹ 5 as depreciation. There is regular Production and Sale cycle and Wages and Overheads accrue evenly. Wages are paid in the next month of accrual and Overheads are paid 15 days in arrears. Material is introduced in the beginning of Production cycle. You are required to find out its working capital requirement on cash cost basis. *[B.Com.(H.), D.U., 2014]*

Solution :

Statement of Working Capital Requirement

I. Current Assets :	
Raw Material (5,750×25×2)	₹2,87,500
Work-in-Progress (5,750×25×1)	1,43,750
Wages (5750×5×1) 50%	14,375
OH (5,750×5×1) 50%	14,375
Finished Goods (5,750×35×1)	6,03,750
Debtors (5,750×35×1) 80%	1,61,000
Total Current Assets	12,24,750

II. Current Liabilities:

Creditors (5,750×25×2)	₹ 2,87,500
Wages (5,750×5×1)	28,750
Overheads (5,750×5×1)	14,375
Total Current Liabilities	3,30,625
Net Working Capital (CA–CL)	₹8,94,125

Working Notes:

Monthly Production (6,90,000/12)	5,750 units
Selling Price	₹50
Raw Material(50%)	₹25
Direct Wages (10%)	₹5
Overheads (20%)	₹10
Cash cost (₹ 25+5+5)	₹35

Illustration 13.7

Following Information is provided by ABC Ltd. :

Raw Material Storage Period	50 days
Work in Progress Storage Period	18 days
Finished Goods Storage Period	22 days
Debt Collection Period	45 days
Creditors Payment Period	55 days
Annual Operating Cost (including Depreciation of ₹ 2,10,000)	₹ 21 lacs
Days in a year	360

Find out : (i) Operating Cycle Period, (ii) No. of Operating Cycles in a year, and (iii) Working Capital Requirement on cash cost basis.

Solution :

Operating Cycle Period :

OC = RMCP + WPCP + FGCP + RCP – DP

= 50 + 18 + 22 + 45 – 55

= 80 days

No. of Operating Cycle in a year :

No. of Cycles = 360 ÷ Length of OC

= 360 ÷ 80 = 4.5 Cycles

Working Capital Requirement :

$$\text{Requirement per day} = \frac{\text{Total Cost (Cash)}}{360}$$

$$= \frac{₹\ 21,00,000 - ₹\ 2,10,000}{360}$$

= ₹ 5,250

Working Capital Requirement = OC × Requirement per day

= ₹ 5,250 × 80

= ₹4,20,000

Illustration 13.8

Prepare an estimate of net working capital requirement for the WCM Ltd. adding 10% for contingencies from the information given below :

Estimated cost per unit of production ₹ 170 includes raw materials ₹ 80, direct labour ₹ 30 and overheads (exclusive of depreciation) ₹ 60. Selling price is ₹ 200 per unit. Level of activity per annum 1,04,000 units. Raw material in stock : average 4 weeks; work-in-progress (assume 50% completion stage): average 2 weeks; finished goods in stock : average 4 weeks; credit allowed by suppliers : average 4 weeks; credit allowed to debtors: average 8 weeks; lag in payment of wages : average 1.5 weeks, and cash at bank is expected to be ₹25,000. You may assume that production is carried on evenly throughout the year (52 weeks) and wages and overheads accrue similarly. All sales are on credit basis only. You may state your assumptions, if any.

Solution :

Statement of Net Working Capital Requirement

A. Current Assets :		
(*i*) Raw Materials in stock :	(1,04,000 × 80 × 4)/52	₹ 6,40,000
(*ii*) Work-in-progress :		
(*a*) Raw Materials	(1,04,000 × 80 × 2)/52	3,20,000
(*b*) Direct Labour	50% of (1,04,000 × 30 × 2)/52	60,000
(*c*) Overheads	50% of (1,04,000 60 × 2)/52	1,20,000
(*iii*) Finished Goods Stock	(1,04,000 × 170 × 4)/52	13,60,000
(*iv*) Debtors	(1,04,000 × 170 × 8)/52	27,20,000
(*v*) Cash at Bank		25,000
Total Current Assets		52,45,000
B. Current Liabilities :		
(*i*) Creditors	(1,04,000 × 80 × 4)/52	6,40,000
(*ii*) Wages (Lag-in-payment) :	(1,04,000 × 30 × 1½)/52	90,000
Total current liabilities		7,30,000
Net Working Capital (CA - CL)		45,15,000
+10% Contingencies		4,51,500
Working Capital Requirement		49,66,500

Assumptions : Net working capital requirement has been estimated on cash cost basis. Hence, investment in debtor has been computed on cash cost.

Illustration 13.9

The management of Royal Industries has called for a statement showing the working capital to finance a level of activity of 1,80,000 units of output for the year. The cost structure for the company's product for the above mentioned activity level is detailed below :

	Cost per unit
Raw Material	₹ 20
Direct Labour	5
Overheads (including depreciation of ₹ 5 per unit)	15
	40
Profit	10
Selling price	50

Additional information :

(*a*) Minimum desired cash balance is ₹ 20,000.

(*b*) Raw materials are held in stock, on an average, for two months.

(*c*) Work-in-progress (assume 50% completion stage in respect of all elements) will approximate to half-a-month's production.

(*d*) Finished goods remain in warehouse, on an average, for a month.

(*e*) Suppliers of materials extend a month's credit and debtors are provided two month's credit; cash sales are 25% of total sales.

(*f*) There is a time-lag in payment of wages of a month; and half-a-month in the case of overheads.

From the above facts, you are required to prepare a statement showing working capital requirements.

Solution :

Statement of Total Cost

Raw Material (1,80,000 × ₹ 20)	₹ 36,00,000
Direct Labour (1,80,000 × ₹ 5)	9,00,000
Overheads (excluding depreciation) (1,80,000 × ₹ 10)	18,00,000
Total cost	63,00,000

Statement of Working Capital Requirement

		Amt. (₹)
1.	**Current Assets :**	
	Cash balance	20,000
	Raw Materials (1/6 of ₹ 36,00,000)	6,00,000
	Work-in-progress (Total cost ÷ 24 × 50%)	1,31,250
	Finished Goods (Total cost ÷ 12)	5,25,000
	Debtors (75% × ₹ 63,00,000) × 1/6	7,87,500
	Total current assets	20,63,750
2.	**Current Liabilities :**	
	Creditors (₹ 36,00,000) × 1/12	3,00,000
	Direct labour (₹ 9,00,000) × 1/12	75,000
	Overheads (₹ 18,00,000) × 1/24 (excluding dep.)	75,000
	Total current liabilities	4,50,000
	Net working capital requirement	16,13,750

Note : *Depreciation is a non-cash item, therefore, it has been excluded from total cost as well as working capital provided by overheads. Work-in-progress has been assumed to be 50% complete in respect of materials as well as labour and overheads expenses.*

Illustration 13.10

Hi-tech Ltd. plans to sell 30,000 units next year. The expected cost of goods sold is as follows :

	₹(Per Unit)
Raw Material	100
Manufacturing expenses	30
Selling, administration and financial expenses	20
Selling price	200

The duration at various stages of the operating cycle is expected to be as follows :

Raw Material stage	2 months
Work-in-progress stage	1 month
Finished stage	1/2 month
Debtors stage	1 month

Assuming the monthly sales level of 2,500 units, estimate the gross working capital requirement if the desired cash balance is 5% of the gross working capital requirement, and work-in-progress is 25% complete with respect to manufacturing expenses. *[B.Com. (H.), D.U., 2013 Adapted]*

Solution :

Statement of Working Capital Requirement

Current Assets :	**Amt.(₹)**	**Amt.(₹)**
Stock of Raw Material (2,500 × 2 × 100)		5,00,000
Work-in-progress :		
Raw Materials (2,500 × 100)	2,50,000	
Manufacturing Expense 25% of (2,500 × 30)	18,750	2,68,750
Finished Goods :		
Raw Material (2,500 × 1/2 × 100)	1,25,000	
Manufacturing Expenses (2,500 × ½ × 30)	37,500	1,62,500
Debtors (2,500 × 150)		3,75,000
		13,06,250
Cash Balance (13,06,250 × 5/95)		68,750
Working Capital Requirement		13,75,000

Note : Selling, administration and financial expenses have not been included in valuation of closing stock. However, Debtors have been valued at full cost. Alternatively, Debtors can also be valued at ₹ 30.

Illustration 13.11

Calculate the amount of working capital requirement for SRCC Ltd. from the following information :

	₹ (Per Unit)
Raw Material	160
Direct Labour	60
Overheads	120
Total cost	340
Profit	60
Selling price	400

Raw materials are held in stock on an average for one month. Materials are in process on an average for half-a-month. Finished goods are in stock on an average for one month.

Credit allowed by suppliers is one month and credit allowed to debtors is two months. Time lag in payment of wages is 1½ weeks. Time lag in payment of overhead expenses is one month. One fourth of the sales are made on cash basis.

Cash in hand and at the bank is expected to be ₹ 50,000 : and expected level of production amounts to 1,04,000 units for a year of 52 weeks.

You may assume that production is carried on evenly throughout the year and a time period of four weeks is equivalent to a month.

Solution :

Statement of Working Capital Requirement

1. Current Assets :	Amount	Amount
Cash Balance		₹ 50,000
Stock of Raw Material (2,000 × 160 × 4)		12,80,000
Work-in-progress :		
Raw Materials (2,000 × 160 × 2)	₹ 6,40,000	
Labour and Overheads (2,000 × 180 × 2) × 50%	3,60,000	10,00,000
Finished Goods (2,000 × 340 × 4)		27,20,000
Debtors (2,000 × 75% × 340 × 8)		40,80,000
Total Current Assets		91,30,000
2. Current Liabilities :		
Creditors (2,000 × ₹ 160 × 4)		12,80,000
Creditors for Wages (2,000 × ₹ 60 × 1½)		1,80,000
Creditors for Overheads (2,000 × ₹ 120 × 4)		9,60,000
Total Current Liabilities		24,20,000
Net Working Capital (CA – CL)		67,10,000

Illustration 13.12

The data of ABC Ltd. is as under:

Production of the year	:	69,000 units
Finished Goods inventory	:	3 months
Raw Materials inventory	:	2 months consumption
Production process	:	1 month
Credit allowed by Creditors	:	2 months
Credit given to Debtors	:	3 months
Selling Price per unit	:	₹ 50 each
Raw Material	:	50% of selling price
Direct Wages	:	10% of selling price
Overheads	:	20% of selling price

There is a regular production on sales cycle, wages and overheads accrue evenly. Wages are paid in the next month of accrual. Material is introduced in the beginning of production cycle. Work-in-process involves use of full unit of raw materials in the beginning of manufacturing process and other conversion costs equivalent to 50%.

You are required to find out working capital requirement of ABC Ltd.

[B.Com. (H.), D.U., 2010]

Solution :

Monthly Production (69000 ÷ 12) = 5750

Statement of Working Capital Requirement

I. Current Assets:		
RM (5,750 × 2 × 25)	₹ 2,87,500	
WIP – RM (5,750 × 1 × 25)	1,43,750	
– W (5,750 × 1 × 5) 50%	14,375	
– O/H (5,750 × 1 × 10) 50%	28,750	
FG (5,750 × 3 × 40)	6,90,000	
Debtors (5,750 × 3 × 40)	6,90,000	₹ 18,54,375
II. Current Liabilities:		
Creditors (5,750 × 2 × 25)	2,87,500	
Wages (5,750 × 1 × 5)	28,750	3,16,250
Working Capital Requirement (CA – CL)		15,38,125

Illustration 13.13

Prepare a working capital forecast from the following information :

Production during the previous year was 10,00,000 units. The same level of activity is intended to be maintained during the current year. The expected ratios of cost to selling price are :

Raw materials	40%
Direct Wages	20%
Overheads	20%

The raw materials ordinarily remain in stores for 3 months before production. Every unit of production remains in the process for 2 months and is assumed to be consisting of 100% raw material, wages and overheads. Finished goods remain in the warehouse for 3 months. Credit allowed by creditors is 4 months from the date of the delivery of raw material and credit given to debtors is 3 months from the date of dispatch.

The estimated balance of cash to be held ₹ 2,00,000

Lag in payment of wages ½ month

Lag in payment of expenses ½ month

Selling price is ₹ 8 per unit. You are required to make a provision of 10% for contingency (except cash). Relevant assumptions may be made.

Solution :

Total Sales = 10,00,000 × 8 = ₹ 80,00,000

Statement of Working Capital Requirement

A. Current Assets :		
Debtors (80,00,000 × 80% × 3/12)	₹ 16,00,000	
Finished Goods (80,00,000 × 80% × 3/12)	16,00,000	
Work-in-progress (80,00,000 × 80% × 2/12)	10,66,667	
Raw Materials (80,00,000 × 40% × 3/12)	8,00,000	
Total current assets	50,66,667	₹ 50,66,667
B. Current Liabilities :		
Creditors (80,00,000 × 40% × 4/12)	10,66,667	
Wages (80,00,000 × 20% × 1/24)	66,667	
Overheads (80,00,000 × 20% × 1/24)	66,666	12,00,000
Excess of CA over CL		38,66,667
+ 10% contingency		3,86,667
		42,53,334
Cash		2,00,000
Working Capital Requirement		44,53,334

Illustration 13.14

AB Ltd. provides the following particulars relating to its working:

(*i*) Cost/Profit per unit:

Raw Material Cost	₹ 84
Direct Labour Cost	36
Overheads (All Variable)	36
Total Cost	156
Profit	44
Selling Price	200

(*ii*) Average Amount of Back up Stock :

Raw Material	1 month
Work-in-Progress (50% Complete)	½ month
Finished Goods	1 month

(*iii*) Credit allowed by Suppliers 1 month

(*iv*) Credit allowed to Customers 2 month

(*v*) Average time lag in the payment of:

Wages	½ month
Overhead Expenses	1½ months

(*vi*) Required Cash in hand and at Bank ₹ 3,00,000.

(*vii*) 25% of the output is sold for cash.

For an expected annual sale of 1,00,000 units, work out the working capital requirement assuming that production is carried on evenly throughout the year and wages and overheads accrue similarly.

Solution:

STATEMENT OF WORKING CAPITAL REQUIREMENT

I. Current Assets:		
Cash		₹ 3,00,000
Raw Material (1,00,000 × 84) ÷ 12		7,00,000
Work in Progress:		
Raw Material (1,00,000 × 84) ÷ 24	₹ 3,50,000	
Labour [(1,00,000 × 36) ÷ 24)] 50%	75,000	
Overhead [(1,00,000 × 36) ÷ 24)] 50%	75,000	5,00,000
Finished Goods (1,00,000 × 156) ÷ 12		13,00,000
Debtors (1,00,000 × 75% × 156) ÷ 6		19,50,000
Total Current Assets (CA)		47,50,000
II Current Liabilities :		
Creditors (1,00,000 × 84) ÷ 12		7,00,000
O/S Wages (1,00,000 × 36) ÷ 24		1,50,000
O/S Overheads (1,00,000 × 36) ÷ 12] × 1.5		4,50,000
Total Current Liabilities (CL)		13,00,000
Net Working Capital Requirement (CA – CL)		34,50,000

Illustration 13.15

Grow More Ltd. is presently operating at 60% level, producing 36,000 units per annum. In view of favourable market conditions, it has been decided that from 1st January 2014, the Company would operate at 90% capacity The following informations are available :

(*i*) Existing cost-price structure per unit is given below :

Raw Material	₹ 4.00
Wages	2.00
Overheads (Variable)	2.00
Overheads (Fixed)	1.00
Profits	1.00

(*ii*) It is expected that the cost of raw material, wages rate, expenses and sales per unit will remain unchanged in 2000.

(*iii*) Raw materials remain in stores for 2 months before these are issued to production. These units remain in production process for 1 month.

(*iv*) Finished goods remain in godown for 2 months.

(*v*) Credit allowed to debtors is 2 months. Credit allowed by creditors is 3 months.

(*vi*) Lag in wages and overhead payments is 1 month. It may be assumed that wages and overhead accrue evenly throughout the production cycle.

You are required to :

(*a*) Prepare profit statement at 90% capacity level; and

(*b*) Calculate the working requirements on an estimated basis to sustain the increased production level.

Assumptions made if any, should be clearly indicated.

Solution :

Statement of Profitability at 90% Capacity

Units (at 90% capacity)	54,000
Sales (54,000 × ₹ 10) (A)	₹ 5,40,000
Cost :	
Raw Material (54,000 × ₹ 4)	2,16,000
Wages (54,000 × ₹ 2)	1,08,000
Variable Overheads (54,000 × ₹ 2)	1,08,000
Fixed Overheads (₹ 1 × 36,000)	36,000
Total cost (B)	4,68,000
Net profit (A–B)	72,000

Statement of Working Capital Requirement

A. Current Assets		
Stock of Raw Materials (2 months × 4,500 × ₹ 4)		₹ 36,000
Work-in-progress :		
Materials (1 month × 4,500 × ₹ 4)	₹ 18,000	
Wages (1/2 month)	4,500	
Overheads (1/2 month)	6,000	28,500
Finished Goods (2 month)		78,000
Debtors [2 months × (4,68,000/12)]		78,000
Total Current Assets		2,20,500
B. Current Liabilities		
Sundry Creditors (3 months)		54,000
Outstanding Wages (1 month)		9,000
Outstanding Overhead (1 month)		12,000
Total Current Liabilities		75,000
Working Capital Requirement (CA – CL)		1,45,500

Working Note :

Overheads and Wages : The work in progress period is one month. So, the wages and overheads included in work-in-progress, are on an average, for half month or 1/24 of a year.

$$\text{Wages} = \frac{₹\ 1,08,000}{24} = ₹\ 4,500$$

$$\text{Overheads} = \frac{₹\ 1,08,000 + 36,000}{24} = ₹\ 6,000$$

The valuation of finished goods can also be arrived at as follows :

Number of units	= 4,500 × 2 = 9,000
Variable cost	= ₹ 8 per unit
Fixed cost (₹ 36,000/12) × 2	= ₹ 6,000
Total cost of finished goods (9,000 × 8) + 6,000	= ₹ 78,000

As the decision to increase the operating capacity from 60% to 90% is already taken, it has been assumed that the opening balance of raw materials, work in progress and finished goods have already been brought to the desired level. Consequently, goods purchased during the period will be only for the production requirement and not for increasing the level of stock.

ASSIGNMENTS

1. Explain the factors considered while determining the need for working capital. *[B.Com.(H.), D.U., 2009, 2012]*
2. Discuss the method of estimation of working capital requirements based on sales.
3. How the value of work-in-progress can be estimated ? What are the relevant factors?
4. Differentiate the working capital requirement based on total cost basis and cash cost basis.
5. "Depreciation should be ignored while determining the working capital need for a firm." Why?

PROBLEMS

P13.1 You are required to prepare a statement showing the working capital needed to finance a level of annual activity of 52,000 units of output. The following information are available :

Elements of cost	**₹ per unit**
Raw Materials	8
Direct Labour	2
Overheads	6
Total cost	16
Profit	4
Selling price	20

Raw materials are in stock, on an average for 4 weeks. Materials are in process, on an average, for 2 weeks. Finished goods are in stock, on an average, for 6 weeks. Credit allowed to customers is for 8 weeks. Credit allowed by suppliers of raw materials is for 4 weeks. Lag in payment of wages is 1½ weeks. It is necessary to hold cash in hand and at bank amounting to ₹ 75,000. It may be noted that production is carried on evenly during the year and wages and overheads accrue similarly.

[*Answer :* Working Capital requirement for 52,000 units (*i.e.*, 1,000 unit per week) is ₹ 3,20,000.]

P13.2 From the following information, prepare a statement showing estimated working capital requirement :

(*i*) Projected Annual sales 26,000 units.

(*ii*) Selling price per unit ₹ 60.

(*iii*) Analysis of selling price :

Material 40%; Labour 30%; Overheads 20%; Profit 10%.

(*iv*) Time lag (on average)

Raw materials in stock 3 weeks.

Production process 4 weeks.

Credit to debtors 5 weeks.

Credit by suppliers 3 weeks.

Lag in payment of wages and overheads 2 weeks.

Finished goods are in stock 2 weeks,

(*v*) Cash in hand is expected to be ₹ 32,000.

[*Answer :* Working Capital requirement is ₹ 2,69,000.]

P13.3 From the following information presented by a manufacturing company, prepare a working capital requirement forecast for the coming year : Expected monthly sales of 32,000 units @ ₹ 10 per unit. The anticipated ratios of cost to selling prices are :

Raw Materials	40%
Labour	30%
Budgeted overheads	₹ 16,000 per week

Overheads expenses include depreciation of ₹ 4,000 per week. Planned stock will include raw materials for ₹ 96,000 and 16,000 units of finished goods.

Materials will stay in process for 2 weeks.

Credit allowed to Debtors is 5 weeks.

Credit allowed by Creditors is 1 month.

Lag in payment of Overheads is 2 weeks.

25% of sales may be assumed against cash and cash in hand is expected to be ₹ 25,000.

Assume that production is carried on evenly throughout the year and wages and overhead accrue similarly. Assume also 4 weeks a month.

[*Answer :* Working Capital requirement for a weekly sales of 8,000 units is ₹ 4,60,000. The overhead cost per unit is ₹ 1.50 (*i.e.*,(16,000–4,000)÷8,000) and cost of goods sold is 85% of selling price.]

P13.4 M/s. PQR and Co. have approached their bankers for their working capital requirement, who has agreed to sanction the same by retaining the margins as under :

Raw Materials	20%
Stock-in-process	30%
Finished goods	25%
Debtors	10%

From the following projections for next year you are required to work out :

(*i*) the working capital required by the company; and

(*ii*) the working capital limits likely to be approved by bankers.

Estimated for next year :

Annual sales	₹ 14,40,000
Cost of production	12,00,000
Raw Materials purchases	7,05,000
Monthly expenditure	25,000
Anticipated Opening Stock of raw materials :	1,40,000
Anticipated Closing Stock of raw materials :	1,25,000

Inventory norms :

Raw Material	2 months
Work-in-progress	15 days
Finished Goods	1 month

The firm enjoys a credit of 15 days on its purchases and allows one month credit on its supplier. On sales orders the company has received an advance of ₹ 15,000. State your assumptions, if any.

[*Answer :* Working capital ₹ 3,50,625, Loan to be approved at ₹ 3,32,750.]

CHAPTER

14

Management of Cash and Marketable Securities

"Every business has to maintain a cash balance to meet needs that can be managed only with cash. The convenience and liquidity associated with keeping cash also carries a cost, however, for cash does not earn a return for the business. Some businesses hold cash equivalents, such as Treasury Bills, which provide almost all of the convenience of cash but also earn a return for the holder, albeit one lower than earned by the business on real projects."[1]

SYNOPSIS

- The Background.
- Motives for Holding Cash.
- Cash Management: Theoretical Framework.
  - Objectives of Cash Management.
  - Factors Affecting Cash Needs.
- Cash Management : Planning Aspects.
  - Cash Budget.
- Cash Management: Control Aspects.
  - Controlling Outflows and Inflows.
- Managing the Float.
  - Investing Surplus Cash.
- Optimal Cash Balance : A few Models.
  - Baumol's Model.
  - Miller-Orr Model.
- Management of Marketable Securities.
- Graded Illustrations in Cash Management.

1.Damodaran, Aswath, *Corporate Finance,* John Wiley and Sons, New York, First Edition, 1997 p. 363.

Cash management refers to management of cash bal ance and the bank balance including the short terms deposits. The cash is obviously the most important current assets, as it is the most liquid and can be used to make immediate payments. Insufficiency of cash at any stage may prevent a firm from discharging its liabilities or force it to sell its other assets immediately. On the other hand, extreme liquidity may take the firm to make uneconomic investments. This underlines the significance of cash management. The term cash may be used in two different ways : One, it may include currency, cheques, drafts, demand deposits held by a firm *i.e.*, pure cash or generally accepted cash equivalents. Second, in a broader sense, it also includes near cash assets such as marketable securities and short term deposits with banks. For cash management purposes, the term cash is used in this broader sense *i.e.*, it covers cash, cash equivalents and those assets which are immediately convertible into cash.

A finance manager is required to manage the cash flows (both inflows and outflows) arising out of the operations of the firm. For this, he will have to forecast the cash inflows from sales and outflows for costs, *etc.* This will enable the financial manager to identify the timings as well as amount of future cash flows. Cash management does not end here and the financial manager may also be required to identify the sources from where cash may be procured on a short term basis or the outlets where excess cash may be invested for a short term.

In most of the firms, the finance manager who is responsible for cash management also controls the transactions that affect the firm's investment in marketable securities. In case of excess cash, marketable securities are purchased; and in case of shortage of cash, a part of the marketable securities is liquidated to procure enough cash. All these issues are important to the financial manager for several reasons. For example, a judicious management of cash, near cash assets and marketable securities allows the firm to hold the minimum amount of cash necessary to meet the firm's obligations as and when they arise. As a result, the firm is not only able to meet its obligations, but also is in a position to take advantage of the opportunity of earning a return and thereby increasing the profitability of the firm.

MOTIVES FOR HOLDING CASH

Cash is the most liquid asset, but it does not earn any substantial return for the business. Nobody earns any income on the cash balance or currency being maintained, however, some interest income may be earned on short term deposits. But still everybody and every firm maintains some cash balance. What is the reason? Why the firm still keep some cash balance? It has been suggested that there are four primary motives for holding cash. These are as follows :

Transaction Motive : Business firms as well as individuals keep cash because they require it for meeting demand for cash flow arising out of day to day transactions. In order to meet the obligations for cash flows arising in the normal course of business, every firm has to maintain adequate cash balance. A firm requires cash for making payments for purchase of goods and services. Supplier of goods are paid in cash, employees are paid in cash, all general operating expenses are also payable in cash. Interest on borrowings, taxes to government and dividends to shareholders are also payable in cash.

These cash outflows are met out of cash inflows arising out of cash sales or recovery from the debtors. However, the inflows may not always be equal to cash outflows. In case the expected outflows are more than the expected inflows, then the deficiency together with some cash for safety margin must be arranged. Further, as the inflows and outflows are not fully and exactly synchronized, a firm is always required to maintain a minimum cash balance with it. The necessity of keeping a minimum cash balance to meet payment obligations arising out of expected transactions, is known as transactions motive for holding cash. The amount of cash a firm must hold to meet the transaction requirements is largely dependent upon the level of sales although the relationship, by no means, may be precisely measurable. In a normal situation, both the inflows and outflows and also the net difference tend to increase or decrease in direct proportion to the level of sales.

Precautionary Motive : The precautionary motive for holding cash is based on the need to maintain sufficient cash to act as a cushion or buffer against unexpected events. In spite of making best efforts, the future cash flows cannot be ascertained with 100% accuracy. One never knows about the happening of natural calamities or sudden increase in the cost of raw materials or any other factor such as strike, lock-out, etc. Such events may seriously interrupt even the best planned financial plans and thus may temporarily make the cash budget ineffective and non-existent. Therefore, a firm should maintain larger cash balance than required for day to day transactions in order to avoid any unforeseen situation arising because of insufficient cash.

The necessity of keeping a cash balance to meet any emergency situation or unpredictable obligation, is known as precautionary motive for holding cash. The more is the possibility of the contingencies, the bigger is the amount required as a precautionary motive. The amount of cash, a firm must hold for transaction and precautionary depends upon :

(*i*) Degree of predictability of its cash flows,

(*ii*) Its willingness and capacity to take risk of running short of cash, and

(*iii*) Available immediate borrowing powers.

A firm wishing absolutely to avoid or minimizing the risk, will tend to have larger cash balances in order to meet all demands. In contrast, a firm willing to assume some risk for the sake of higher returns will tend to invest its cash balance in earning assets.

Speculative Motive : Cash may be held for speculative purposes in order to take advantage of potential profit making situations. A firm may come across an unexpected opportunity to make profit, which is not usually available in normal business routine. Some cash balance may be kept to take advantage of these windfalls *e.g.*, an opportunity to purchase raw materials at a heavy discount, if paid in cash. The motive

to keep cash balance for these purposes is obviously speculative in nature. The firm's desire to keep some cash balance to capitalize an opportunity of making an unexpected profit is known as speculative motive. The speculative motive provides a firm with sufficient liquidity to take advantage of unexpected profitable opportunities that may suddenly appear (and just as suddenly disappear if not capitalized immediately).

Compensation Motive : Commercial banks require that in every current account, there should always be a minimum cash balance. This minimum cash balance may vary from ₹ 5,000 to ₹ 10,000. This amount remains as a permanent balance with the bank so long as the current account is operative. This minimum balance is generally not allowed by the bank to be used for transaction purposes and therefore, it becomes a sort of investment by the firm in the bank. In order to avail the convenience of current account, the minimum cash balance must be maintained by the firm and this provides the compensation motive for holding cash.

Out of different motives, the transactions motive is the most obvious one and is found in every firm. Even the precautionary motive is common and a firm maintains cash balance both for the transactions motive and the precautionary motive. However, the speculative motive is a subjective one and may differ from one firm to another. Generally, the speculative motive is the least important component of a firm's preference for liquidity. The transactions and the precautionary motives account for most of the reasons why a firm holds cash balance. The compensation motive may be a compulsion and the firm may not have many options.

The cash held for transaction motive is necessary, the cash held for precautionary motive provides a margin of safety, but holding of cash does not generate any explicit monetary return, rather it involves a cost. The main cost of holding cash is the loss of interest which the firm could otherwise earn by investment of cash elsewhere. This and various other aspects of management of cash have been discussed in the following sections.

CASH MANAGEMENT: THEORETICAL FRAME-WORK

If during a year, the cash inflows of a firm balance its cash outflows exactly, the job of the financial manager would be greatly simplified. Unfortunately, this does not often happen. What is more, there are times during the course of a year when the cash outflow may exceed the inflows by an amount sufficient to prevent the financial manager from meeting his firm's regular financial obligations, unless he takes steps to secure additional cash funds. These imbalances may result from external causes over which the management has little or no control; or they may be the result of changes made in the firm's manufacturing, purchasing or selling policies. Since it is the responsibility of the financial manager to provide sufficient cash funds to pay all liabilities as and when they arise, he must correct such imbalances by pumping additional cash into the firm. Alternatively, in situations where the imbalance lies in the other direction *i.e.*, when too much cash has become available, he must make sure that the excess cash (but no more or no less) is removed and put to some income earning asset.

A firm may not face any problem in undertaking various activity and entering into various transactions if it is having adequate and sufficient cash balance. For this purpose, the financial manager should ensure that the firm is having ***Right quantity and Right quality of liquidity from Right source at Right price and at Right time.*** Cash management, thus deals with optimization of cash as an asset and for this purpose the financial manager has to take various decisions from time to time. He has to deal as the cash flows director of the firm. Even if a firm is highly profitable, its cash inflows may not exactly match the cash outflows. He has to manipulate and synchronize the two for the advantage of the firm by investing excess cash if any as well as arranging funds to cover the deficiency. Cash management is the problem of every firm and requires the analysis of various considerations as follows :

Objective of Cash Management : The financial manager must know as to why the cash management is a necessity. The cash management strategies are generally built around two goals : (*a*) to provide cash needed to meet the obligations, and (*b*) to minimize the idle cash held by the firm. The financial manager has to strike an acceptable balance between holding too much cash and too little cash. This is the focal point of the cash risk-return trade-off. A large cash investment minimizes the chances of default but penalizes the profitability of the firm. A small cash balance target may free the excess cash balance for investment in marketable securities and thereby enhancing the profitability as well as value of the firm, but increases simultaneously the chances of running out of cash. The risk-return trade-off of any firm can be reduced to two prime objectives for the firm's cash management system, as follows :

(*i*) ***Meeting the Cash Outflows :*** The primary objective of cash management is to ensure the cash outflows as and when required. Enough cash must be on hand to meet the disbursal needs that arise in the normal course of business. The firm should be able to make the payments at different point of time without any liquidity problem. It mean that the firm should have sufficient cash to meet the payment schedules and disbursement needs. It will help the firm in (*a*) avoiding the chance of default in meeting financial obligations, otherwise the goodwill of the firm is adversely affected, (*b*) availing the opportunities of getting cash discounts by making early or prompt payments, and (*c*) meeting unexpected cash outflows without much problem.

(*ii*) ***Optimizing the Cash Balance :*** Investment in idle cash balance must be reduced to a minimum. This objective of cash management is based on the idea that unused asset earns no income for the firm. The funds locked up in cash balance is a dead investment and has no earning. Therefore, whatever cash balance is maintained, the firm is foregoing interest income on that balance. The objective of the cash management therefore, should be to keep an optimum cash balance. However, the objective of cash

management *i.e.*, maintaining the optimum cash balance must be looked into together with the other objectives *i.e.*, maintaining the payment schedule, etc., which require that a firm must have sufficient liquidity (even at the cost of reducing profitability). But the objective of minimum cash balance affects the liquidity and thereby increasing the profitability. Thus, these objectives seem to be contradictory in nature, and the financial manager has to achieve a trade-off between them. He has to ensure that the minimum cash balance being maintained by the firm is not affecting the payment schedule and meeting all disbursement needs. The cash management strategies are needed to reconcile these two goals wherever possible. However, meeting payment commitments takes higher priority than minimizing the cash balance.

Factors Affecting the Cash Needs : It has already been said that the financial manager has to achieve a trade-off between liquidity and profitability and in doing so he should note that there are various factor which will determine the amount of cash balance to be kept by the firm. Some of these factors are as follows :

(*a*) ***Cash Cycle :*** The term cash cycle refers to the length of the time between the payment for purchase of raw material and the receipt of sales revenue. So, the cash cycle refers to the time that elapses from the point when the firm makes an outlay to purchase raw materials to the point when cash is collected from the sale of finished goods produced using that raw material. Different patterns of cash cycles and cash flows may be there depending upon the nature of the business. The cash cycle is that part of the operating cycle that must be financed by the firm. The concept of cash cycle has been depicted in Figure 14.1.

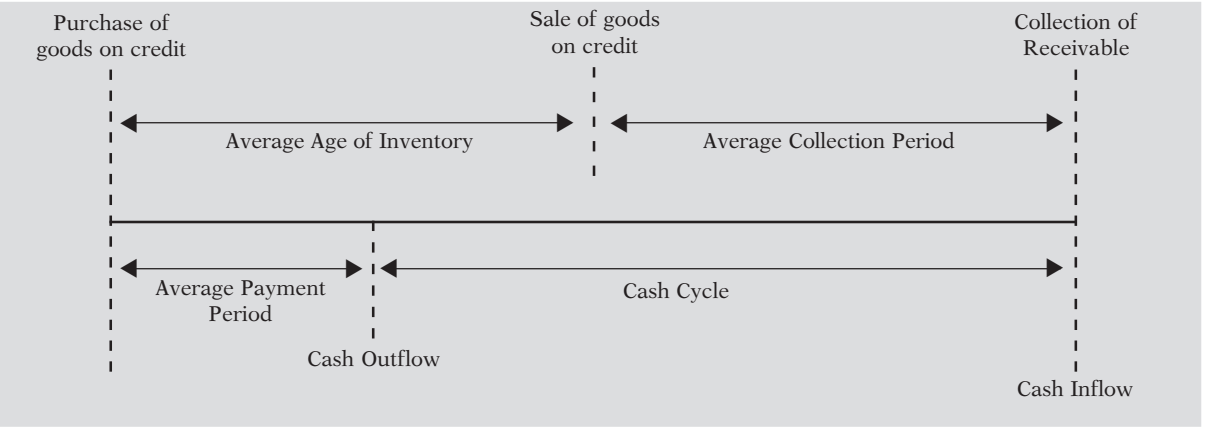

FIGURE 14.1 : CASH CYCLE

(*b*) ***Cash Inflows and Cash Outflows :*** Every firm has to maintain cash balance because its expected inflows and outflows are not always synchronized. The timings of the cash inflows may not always match with the timing of the outflows. Therefore, a cash balance is required to fill up the gap arising out of difference in timings and quantum of inflows and outflows. If the inflows are appearing just at the time when cash is required for payment, then no cash balance will be required to be maintained by the firm. But this seldom happens. So, the financial manager has to identify the timings and quantity by which the inflows will not be synchronized with the outflows and an arrangement must be made to fill the gap.

(*c*) ***Cost of Cash Balance :*** Another factor to be considered while determining the minimum cash balance is the cost of maintaining excess cash or of meeting shortages of cash. There is always an opportunity cost of maintaining excessive cash balance. If a firm is maintaining excess cash then it is missing the opportunities of investing these funds in a profitable way. Similarly, if the firm is maintaining inadequate cash balance than it may be required to arrange funds on an emergency basis to meet any unexpected shortage. Even if the shortage is expected to continue only for a short period, yet the funds are to be arranged and there will always be a cost (may be more than normal cost) of raising fund.

(*d*) ***Other Considerations :*** In addition to the above factors, there may be some other considerations also affecting the need for cash balance. There may be several subjective considerations such as uncertainties of a particular trade, staff required for cash management *etc.*, which will have a bearing on determining the cash balance required by a firm.

CASH MANAGEMENT: PLANNING ASPECTS

In order to maintain an optimum cash balance, what is required is (*i*) a complete and accurate forecast of net cash flows over the planning horizon and (*ii*) perfect synchronization of cash receipts and disbursements. Thus, implementation of an efficient cash management system starts with the preparation of a plan of firm's operations for a period in future. This plan will help in preparation of a statement of receipts and disbursements expected at different point of time of that period. It will enable the management to pin point the timing of excessive cash or shortage of cash. This will also help to find out whether there is any expected surplus cash still unutilized or shortage of cash which is yet to be arranged

for. In order to take care of all these considerations, the firm should prepare a cash budget.

A cash budget is a summary of movement of cash during a particular period. There are three methods of preparation of cash budget. These are (*i*) Adjusted Net Income, (*ii*) Proforma Balance Sheet, and (*iii*) Cash Receipts and Disbursements. In all these methods, the information with which the final cash budget is constructed is basically the same. However, they utilize different forecasting techniques and therefore, the information they provide to the financial manager is quite different.

(*i*) ***Adjusted Net Income Method*** requires that a proforma income statement should be prepared for each desired interim period of the budget period. The net income figures for each period are then adjusted to a cash basis by deleting the transactions that are affecting the income statements but not the cash balance or the items which affect the one without affecting the other. This adjusted figure is taken as cash profit (loss) during that period. This can be taken as net increase or decrease in cash balance during that period.

(*ii*) ***Proforma Balance Sheet Method*** requires the preparation of as many proforma balance sheets as there are interim periods in the cash budget. Each item of the balance sheet except cash is projected for each period, and the cash balance is ascertained in accordance with the accounting equation *i.e.*, Total Assets = Total Liabilities + Capital. The balancing figure of the proforma balance sheet is taken as the cash balance. A negative cash balance or a cash balance falling below minimum desirable balance would, of course, indicate a need for borrowing funds or otherwise adjusting the flow to make up the anticipated shortages of cash.

Both these approaches to the preparation of cash budget tend to limit their use to those firms having stable earnings and sales and also having cash surpluses. First, neither method produces an item by item forecast of cash receipts and disbursements, and consequently, it is difficult for the financial manager to plan the timing of the firm's payment closely with its anticipated receipts. Second, the lack of details also makes its difficult to locate an appropriate item for adjusting the timing of cash flows during the budget period. The cash receipts and disbursements is probably the best method of construction of cash budget and has been discussed as follows :

(*iii*) ***Receipts and Payments Method of Cash Budget :*** Cash budget, under this method, is a statement projecting the cash inflows and outflows (receipts and disbursements) of the firm over various interim periods of the budget period. For each period, the expected inflows are put against the expected outflows to find out if there is going to be any surplus or deficiency in a particular period. Surplus, if any, during a particular period may be carried forward to the next period or steps may be taken to make short term investments of this surplus. Deficiencies, if any, must be arranged for within the same period from some short term sources of finance such as bank credit.

The cash budget, under the receipts and payments method may be prepared on a monthly basis or quarterly or half-yearly basis. For every month/quarter/half-year, there is an opening cash balance, expected inflows and expected outflows during that period and a closing balance of cash at the end of that period. The cash inflows may be consisting of all receipts whether from cash sales; or realization from debtors; or income from investment; or sale proceed of any investment or assets; or any loan expected from bank *etc.;* or a subsidy expected from Government, *etc.* The cash outflows, on the other hand, may include payment for materials, labour and overheads, taxes dividends and interest, loan repayments, purchase of assets, statutory deposits, *etc.* The cash budget, as the name itself suggests, is prepared on the cash basis (against the accrual basis of accounting) and hence non-cash items such as depreciation expense etc., are ignored.

Under the receipts and payments method of preparation of cash budget, first of all, the cash budget period is selected. A financial year is no doubt the overall period within which smaller interim periods, say a week or a month or a quarter is selected. Now, detailed cash inflows and outflows for each interim period are noted down. Beginning with the opening cash balance, the expected cash inflows during each period are added to it and from the total, the expected outflows for that period are deducted to find out the cash balance at the end of that period. This closing cash balance becomes the opening cash balance of the next period and so on.

All types of expected cash inflows and outflows *i.e.*, revenue nature cash flows, capital nature cash flows, transaction cash flows, precautionary cash flows and speculative cash flows are incorporated because all these affect the cash balance required during particular period, and moreover these cash flows are consistently changing from one period to another. The interaction among these three cash flows results in a need to identify the minimum cash balance *i.e.*, desired at any point of time.

While preparing the cash budget, this desired minimum cash balance is considered at the end of each of the cash budget period. If a firm is preparing monthly cash budget, then the cash balance at the end of each month must be equal to the desired cash balance. If not, then arrangements must be made/planned to increase the cash balance at that time by procuring funds from some or the other source. A proforma cash budget has been presented in Table 14.1.

TABLE 14.1: PROFORMA CASH BUDGET (MONTHLY BASIS)
MONTHLY CASH BUDGET FOR THE YEAR .....

	January	February	.....	November	December
Opening Cash Balance	****	****	****	****	****
Cash Inflows					
Cash Sales	****	****	****	****	****
Collection from Debtors	****	****	****	****	****
Loans and Borrowings	****	****	****	****	****
Subsidy	****	****	****	****	****
Other Incomes	****	****	****	****	****
Total Cash Available (A)	****	****	****	****	****
Cash Outflows :					
Payment to Creditors	****	****	****	****	****
Wages and Salaries	****	****	****	****	****
Other expenses	****	****	****	****	****
Fixed assets purchase	****	****	****	****	****
Investments	****	****	****	****	****
Repayment of debts	****	****	****	****	****
Interest and Taxes	****	****	****	****	****
Dividend payment	****	****	****	****	****
Total Payments (B)	****	****	****	****	****
Closing Balance (A–B)	****	****	****	****	****
+Funds required	****	****	****	****	****
–Excess cash to be invested	****	****	****	****	****

It may be noted that the preparation of cash budget (as per receipts and payments method) requires forecast of different receipts and disbursements by the firm during each of the interim period.

Forecasting the Receipts:

(*i*) **Sales Based Receipts :** The sales budget constitutes the foundation open which the entire budget program of the firm is developed. An accurate sales budget is the product of a careful forecast of sales, usually prepared by several methods to ensure that all factors affecting the firm's sales have been considered. The sales forecast should be compared with the production capacity of the firm to see whether the predicted unit sale are within the ability of the firm to produce. Finally, all the forecasts are brought together to determine whether there is a consensus. If there is a difference, then it must be reconciled. Once this has been done, the financial manager can begin the process of constructing the cash budget from the collection of predicted sales.

At this stage, it is necessary, first, to separate cash sales from credit sales and then to analyze the credit sales for the purpose of determining the time lag between sales and collection. Particular care must be taken of the effect of seasonal variations and of general business conditions on the collections and on the length of the collection period. Second, other factors affecting the firm's collection must also be taken into account. For example, the returns and allowances must be estimated, particularly if cash refund is to be made. The amount of cash discount that the customers are likely to take should also be estimated. The effect of any planned changes in either the credit policy or the collection policy must also be taken into account.

(*ii*) **Other Receipts :** Most of the business firms may receive cash during the course of their operations from sources other than the sales of their products and services. These receipts may be of relatively small magnitude when compared to sales receipt yet must be included in the cash budget. These cash inflows may include income from property, interest and dividends from investments, sale of assets and investments, royalties income etc. Such receipts generally do not pose much problem in forecasting, because they are of small magnitude and specific. These items have only a minor impact on the overall cash budget.

Forecasting the Payments:

(*i*) **Payments for Materials *etc.* :** The amount and the timing of payments for raw materials or for finished goods during given period is closely related to the sales volume of the firm. However, this relationship is not necessarily precise. It may be upset by a decision to increase or decrease size of any or all items of the inventories of raw materials, work-in-progress or of finished goods. Obviously, an increase in inventories would require purchases in excess of those required to support estimated sales. A decision to decrease inventories would lower the volume of purchases needed. Also, a decision to produce highly seasonal goods at a constant rates through out the year

would require regular payments, though the goods would be sold only during the season. Therefore, while the volume of sales will determine the basic purchase requirements, the production schedule and the inventory policies will influence the timing and quantity of goods purchased. This in turn, will affect the cash outflows on account of payments for these purchases.

(*ii*) **Payment for Operating Expenses :** The cash disbursements for operating expenses may be listed in the cash budget under the headings of manufacturing, selling and administrative expenses. These expense categories may also be classified as fixed expenses, variable expenses or semi-variable expenses, for purposes of forecasting the timing and magnitude of cash outflows. Fixed expenses, by definition, are those that are expected to remain constant regardless of the level of production. Although, the level of these expenses is independent of the level of production, they cannot be expected to remain constant forever. Any expected change must be recorded in the cash budget. Variable expenses are those that are expected to vary directly with the level of production or sales. Examples of these expenses may be packaging, sales commission and administrative costs.

(*iii*) **Other Cash Disbursements :** Included in this category of other cash disbursements are items that usually create no problem in forecasting the timing as well as amount of a cash outflow. Such outflows may be relating to interest payments, repayments of loans, redemption of debentures and preference share capital, distribution of dividends, purchase of assets and investments, *etc.*

Importance and Significance of Cash Budget : Cash budget is an effective tool of cash management and it may help the management in the following ways.

(*a*) Identification of the period of cash shortage so that the financial manager may plan well in advance about arranging the funds at an appropriate time.

(*b*) Identification of cash surplus position and duration for which surplus would be available so that alternative investment of this excess liquidity may be considered in advance.

(*c*) Better coordination of the timing of cash inflows and outflows in order to avoid chances of shortages or surplus of cash, etc.

The most widely used method of preparation of cash budget is the receipts and disbursements method, and it is by far the most flexible of the three discussed above. It is the most suitable for the companies faced with considerable uncertainty regarding their cash flows because of volatile sales and earnings records, and for the firms that are experiencing tight cash position. This method permits more frequent interim forecast, on a weekly or bi-monthly basis, and thus enables the financial manager to maintain more effective control over cash flows. The cash budget records each source of receipts as well as disbursements so that the actual performance during the budget period can be compared with the budget in great detail. This facilitates the matching of the timing of cash payments with the firm's receipts on a continuous basis and thereby reducing idle cash balance to a minimum level as well as help avoiding the chances of a cash shortage.

In summary, the cash budget may be an indispensable tool in the hands of a financial manager, when it comes to planning for borrowings, repayments of loans, distribution of dividends and effective utilization of excess or idle cash. However, the cash budget, though it may be indispensable, is not without its own limitations. Errors in estimations any where along the long line of budgeting exercise, will obviously will create inaccuracies in the cash budget. This means that the cash budget should be, or rather must be reviewed periodically against actual performance so that modifications and alterations may be incorporated as and when required. Examples 14.1 and 14.2 illustrate the preparation of cash budget.

Example 14.1

The following forecasts have been made for ABC Ltd. for the period January to April 2016.

	January	February	March	April
Sales	₹ 75,000	₹ 1,05,000	₹ 1,80,000	₹ 1,05,000
Raw Materials	70,000	1,00,000	80,000	85,000
Manufacturing Expenses	10,000	20,000	29,000	16,000
Loan Instalment	1,000	11,000	21,000	21,000

Additional Information:

(*i*) All sales are made on credit basis. 2/3 of debtors are collected in the same month and balance in the next month. There is no expected bad debt. The debtors on January 1, 2016 were ₹ 30,000.

(*ii*) The minimum cash balance, the firm must have is estimated to be ₹ 5,000, however, the cash balance on January 1 was ₹ 6,500.

(*iii*) Borrowing if any, can be made in multiple of ₹ 100 only.

Prepare the cash budget for the period of 4 months (ignore interest on borrowing).

Solution :

CASH BUDGET FOR THE PERIOD JANUARY-APRIL 2016

	January	February	March	April
Opening Cash	₹ 6,500	₹ 5,500	₹ 5,000	₹ 5,000
Inflows:				
Debtors (Previous Month)	30,000	25,000	35,000	60,000
Debtors (Current Month)	50,000	70,000	1,20,000	70,000
Total cash available (A)	86,500	1,00,500	1,60,000	1,35,000
Outflows :				
Raw Materials	70,000	1,00,000	80,000	85,000
Manufacturing Expenses	10,000	20,000	29,000	16,000
Loan Instalment	1,000	11,000	21,000	21,000
Total Outflows (B)	81,000	1,31,000	1,30,000	1,22,000
Cash Balance (A–B)	5,500	–30,500	30,000	13,000
Borrowings (Refund)	–	35,500	(25,000)	(8,000)

The firm will have to borrow ₹ 35,500 during February so that the ending balance of February is ₹ 5,000. However, during

the months of March and April, it will have surplus and will refund ₹ 25,000 and ₹ 8,000 respectively. At the end of April, the firm will have a balance of ₹ 5,000 and outstanding borrowings of ₹ 2,500 (*i.e.*, ₹ 35,500–25,000–8,000). As there is no bad debts and 2/3 of debtors are collected in the same month, the remaining 1/3 debtors (*i.e.*, sales) are collected in the next month.

Example 14.2

Prepare cash budget for the period of July-December 2016 from the following information :

(*i*) The estimated sales and expenses are as follows :

(Figures in ₹ lacs)

	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Sales	35	40	40	50	50	60	65
Purchases	14	16	17	20	20	25	28
Wages and Salaries	12	14	14	18	18	20	22
Expenses	5	6	6	6	7	7	7
Interest received	2	—	—	2	—	—	2
Sale of Fixed assets	—	—	20	—	—	—	—

(*ii*) 20% of the sales are made on cash and balance on credit. 50% of the debtors are collected in the month of sales and the remaining in the next month.

(*iii*) The time lag in payment of purchases and expenses is 1 month, however, wages and salaries are paid fortnightly with a time lag of 15 days.

(*iv*) The company keeps a minimum cash balance of ₹ 5 lacs. The cash balance in excess of ₹ 7 lacs is invested in Government Securities in multiple of ₹ 1 lac. Shortfalls in cash balance are made good by borrowing from banks The interest received as well as paid is to be ignored.

Solution :

CASH BUDGET FOR THE PERIOD JULY-DECEMBER 2016

(Figures in ₹ lacs)

	July	Aug.	Sept.	Oct.	Nov.	Dec.
Cash in the beginning	5	7	7	7	7	7
Cash Inflows :						
Cash Sales	8	8	10	10	12	13
Debtors Collection	30	32	36	40	44	50
Interest Received	—	—	2	—	—	2
Sale of fixed assets	—	20	—	—	—	—
Total cash (A)	43	67	55	57	63	72
Cash Outflows :						
Purchases	14	16	17	20	20	25
Expenses	5	6	6	6	7	7
Wages and Salaries	13	14	16	18	19	21
Total Outflows (B)	32	36	39	44	46	53
Balance at the end (A–B)	11	31	16	13	17	19
Investment in Government Securities	4	24	9	6	10	12
Closing Balance	7	7	7	7	7	7

Working Notes :

1. Cash collected from debtors has been calculated as follows :

(Figures in ₹ lacs)

	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Credit sales	28	32	32	40	40	48	52
Cash collected (Previous Month)	—	14	16	16	20	20	24
Cash collected (Current Month)	—	16	16	20	20	24	26
Total cash collected	—	30	32	36	40	44	50

2. Cash balance in excess of ₹ 7,00,000 has been invested in Government Securities. No borrowing is required in any of these month as the cash balance is more than the minimum cash requirement.
3. Since wages and salaries are payable with a time lag of 15 days, therefore, in a particular month the amount of wages and salaries payable would be the sum of wages and salaries of the 2nd half of the previous month and the 1st half of the current month.

Note : *In Examples 14.1 and 14.2, it is specifically mentioned that the interest on borrowing is to be ignored. However, if interest is also to be incorporated then an implied assumption is that funds are borrowed in the beginning of the month in which the shortage is expected, and borrowing are repaid at the end of the month in which excess (surplus) funds are expected. This means that interest at the given rate is payable for both the months.*

CASH MANAGEMENT: CONTROL ASPECTS

After the preparation of cash budget, the financial manager should also ensure that there are no significant differences between the expected/budgeted cash flows and the actual cash flows. This requires controlling and reviewing of the whole exercise on a regular basis. The financial manager should take appropriate steps for preventing any unexpected deviation in both the inflows as well as the outflows. These include decisions that answer the following questions :

(*i*) What can be done to speed up cash collections and slow down or better control cash outflows?

(*ii*) What should be the composition of a marketable securities portfolio?

The efficiency of the firm's cash management program can be enhanced by the knowledge and use of various procedures aimed at (*a*) accelerating cash inflows, and (*b*) controlling cash outflows. The following points are worth noting at this stage.

Controlling Inflows : The financial manager should take steps for speedy recovery from debtors and for this purpose proper internal control system should be installed in the firm. Once the credit sales have been effected, there should be a built-in mechanism for timely recovery from the debtors. Periodic statements should be prepared to show the outstanding bills.

Incentives offered to the customers for early/prompt payments should be well communicated to them. Once the cheques/drafts are received from customers, no delay should be there in depositing these receipts with the banks. The time lag in collection of receivables can be considerably reduced by managing the time taken by postal intermediaries and

banks. Concentration banking and lock box system help reducing this time lag.

A firm may open collection centres (banks) in different parts of the country to save the postal delays. This is known as ***concentration banking.*** Under this system, the collection centres are opened as near to the debtors as possible, hence reducing the time in despatch, collection etc. The firm may instruct the customers to mail their payments to a regional collection centre/bank rather than to the Central Office. The concentration banking results in saving of time of collection and hence result in better cash management. However, the selection of collection centres must be based on the volume of billing/business in a particular geographical area. It may be noted that the concentration banking also involve a cost in terms of minimum cash balance required with a bank or in the form of normal minimum cost of maintaining a current account. So, the concentration banking as a tool of controlling inflows may be availed by big firms only.

Under the ***lock-box system,*** the customers mail their payments to a post office box near their work place. The firm arranges with a local bank or some other agency to collect the payments and credit to the firm's account as quickly as possible. The lock-box system is economical only if there is a relatively large number of payments being received in a particular area, as the expenses attached for maintaining the system may be significant. In India, the lock-box system is not popular. However, commercial banks usually provide service to their large clients of (*i*) collecting the cheques from the office of the client, and (*ii*) sending the high value cheques to the clearing system on the same day. Both these services help reducing the float of the large clients. However, these benefits are not free. Usually, the bank charges a fee for each cheque processed through the system. The benefits derived from the acceleration of receipts must exceed the incremental costs of the lock-box system, or the firm would be better off without it.

The concentration banking and the lock-box system attempt to (*i*) reduce the mailing time of customers payments, (*ii*) reduce the time during which payments received remained uncollected, and (*iii*) speed of the movement of cash to the main office for disbursements etc.

Controlling Outflows : An effective control over cash outflows or payments also help a firm in better cash management and reducing cash requirements. A financial manager should try to slow down the payments as much as possible. However, care must be taken that the goodwill and credit rating of the firm is not affected. Payments to creditors need not be delayed otherwise it may be difficult to secure trade credits at a later stage. There is a no need to make any early payment unless there is a discount offered. The credit facility allowed by creditors should be fully utilized. The discount offered by creditors for prompt payment must be evaluated properly in terms of costs and benefits of the discounts.

Balance lying in the bank account should also be so managed as to take maximum advantage out of it. There may not be a balance in the bank account when a cheque is issued but there must be sufficient balance when the cheque is expected to be presented for payment. Outflows on account of expenses may also be delayed as far as possible, particularly when the expenses can be accrued easily. For example, if tax is to be deposited within 7 days of the expiry of a month, then tax must be paid only on the 7th day and not before.

Thus effective control of disbursements/outflows can result in larger cash balances. The underlying objective regarding cash outflows should be maximize the delays in making payments, without however, affecting the firm's goodwill and credit rating.

MANAGING THE FLOAT

With reference to the control of inflows and outflows, float is an important technique to lessen the length of the cash cycle. When a firm receives or makes payments in the form of cheques etc., there is usually a time gap between the time the cheque is written and when it is cleared. This time gap is known as float. The float for the paying firm refers to the time that elapses between the point when it issues a cheque and the time at which the funds underlying the cheque are actually debited in the bank account. For the payee firm, float refers to the time between the receipt of the cheque and the availability of the funds in its account. So, float denotes the funds that have been despatched by a payer (the firm making the payment) but are not in a form that can be spent by the payee (the firm receiving the payment). The float also exists when a payee has received funds in a spendable form but these funds have not been withdrawn from the account of the payer. Float has three components :

(*i*) **Mail Time :** It is the period between the issue of a cheque and its receipt by the payee.

(*ii*) **Processing Time :** It is the time between the cheque received by the payee and the deposit of the cheque in the bank account of the payee, and

(*iii*) **Collection Time :** It is the amount of time for transferring funds, through banking system, from the payer's account to that of the payee. In India, this collection time is generally three days, including the day of depositing a cheque.

To get an idea of the float mechanism and its utility in the management cash inflows and outflows, one must know the related banking procedure. When a cheque is issued by the paying firm, the bank balance of the firm is not immediately reduced, rather the bank reduces the balance only when the cheque is presented to it either personally or through the clearing system. The amount of cheques issued but not presented for payment is known as the payment float. Similarly, when the firm receives a cheque from the customer and deposits the cheque in the firm's account, the amount is not immediately credited to the firm's account, rather the banks credits the cheque amount only when it is cleared by the paying bank. The amount of cheques deposited in the banks, but not yet cleared, is known as the **receipt float**. The difference between the payment float and the receipt float is known as **net float.**

The net float at a point of time is simply the overall difference between the firm's available bank balance and the balance shown by the ledger account of the firm. If the net float is

positive, *i.e.*, payment float is more than receipt float, then the available bank balance exceeds the book balance. However, if the available bank balance is less than the book balance, then the firm has net negative float. If a firm has positive net float (*i.e.*, the payment float is more than the receipt float), it can issue more cheques even if the net bank balance shown by the books of account may not be sufficient. A firm with a positive net float can use it to its advantage and maintain a smaller cash balance than it would have in the absence of the float. For example, a firm has a payment float of ₹ 1,00,000 and receipt float of ₹ 80,000. This firm has a positive net float, which may be ascertained as follows :

Net float = Payment float – Receipt float
= ₹ 1,00,000– 80,000 = ₹ 20,000.

Example 14.3

Tiffin Services Ltd. issues cheques of ₹ 3,000 per day and receives cheques of ₹ 2,000 per day. The payment float is 7 days while the receipt float is 2 days on an average. Find out different floats for the firm.

Solution :

Different floats for the firm are as follows :

Disbursement = Amount × No. of days
= ₹ 3,000 × 7 = ₹ 21,000
Collection Float = Amount × No. of days
= ₹ 2,000 × 2 = ₹ 4,000
Net Float = Disbursement Float – Collection Float
= ₹ 21,000 – ₹ 4,000 = ₹ 17,000

So, the firm's net book balance is ₹17,000 less than the actual balance available in the bank.

Float and Electronic Fund Transfer : With the growth in use of computers, banks are now providing electronic fund transfer and electronic clearing transfer securities. Dividends payments by companies, Refund of subscription money in case of IPOs and Refund of tax by Income-tax Deptt. are now being made through electronic clearing facility wherein the funds are transferred from one account to another within a few moments across India. In such transfers, there is no float as such. Business houses are also using these facilities and payments and receipts are effected through electronic clearing system. If it is so, then the question of float management does not arise. These systems are known as Real Time Gross Settlement (RTGS) and National Electronic Fund Transfers (NEFT). Even where the cheques are being used for payment, float period is reducing because of greater efficiency on the part of the banking system.

Investing Surplus Cash : On the basis of the cash budget, the financial manager may find that excess cash will be available for sometime. This excess cash may be temporarily idle or may represent a permanent surplus balance. If the cash budget indicates that the excess cash is a permanent accumulation, then it may be invested in some profitable capital project.

However, if a surplus cash is expected in a particular month, or for a short period of a few months only, then the financial manager should take steps to invest this excess money and earn some income. The determination of the surplus cash is a very critical exercise and a lot depends upon the experience of the financial manager. He should take care of the transactions, precautionary demand as well as sudden fluctuations in market before going for the investment of the surplus cash. He should also be careful in selecting the investments and proper attention should be paid with reference to the safety, liquidity, return and maturity period of the investment. This aspect has been discussed in detail at a later stage.

Arranging Funds for Cash Shortages : If a financial manager is anticipating cash shortage in any particular month, then he should devise ways to arrange additional funds for the requirement period from some reliable source. These requirements of funds are generally for a short duration only and hence funds from short term sources of finance like bank loan etc., may be arranged. However, if cash shortage is expected on a regular basis then the long term sources of funds may be tapped.

OPTIMUM CASH BALANCE : A FEW MODELS

The cash budget for a firm may indicate the period when it is expected to have a shortage or surplus of funds. If a shortage is expected, ways and means of over coming it must be thought of; and in case of expected surplus, its profitable usage in marketable securities should be explored. However, before converting cash into marketable securities and *vice-versa*, the financial manager must determine and assess the optimum cash balance for the firm. He should also find out when and how much cash is to be converted. The problem of determining optimum cash balance for a firm in fact, implies a trade-off between risk and return of maintaining cash balance. Several models, have been suggested to deal with the problem of optimum cash balance. Two important models have been discussed here.

Baumol's Model : Suggested by W.J. Baumol (1952), this model is the same as the economic order quantity model of the inventory management. This model attempts to balance the income foregone on cash held by the firm against the transaction cost of converting cash into marketable securities or *vice versa*. This model can be presented as follows :

Assumption : The Baumol's model assumes that the firm uses cash at an already known rate per period and that this rate of use is constant.

Holding Cost : There is always a cost of holding cash by a firm. This cost may be the opportunity cost in terms of the interest foregone on the investment of this cash.

Transaction Cost : Whenever cash is to be converted into marketable securities, or *vice-a-versa*, there is always a cost involved in the form of brokerage, commission etc.

This model is based on the proposition that in order to reduce the holding cost, a firm keeps the least amount of cash in hand. However, as the cash level depletes, the firm can acquire cash by selling some of its marketable securities. Each time the firm transacts in this way, it bears transaction cost, so, it will like to transact as occasionally as possible. This could be done by maintaining a higher cash level involving a high holding cost. Thus, the firm has to deal with the holding cost as well as

the transaction cost. The optimum cash balance is found by controlling the holding cost and transaction cost so as to minimize the total cost of holding cash. In other words, the cash is recovered by selling marketable securities in such a way that the transaction cost is optimally balanced with the holding cost of cash. This model is almost the same as EOQ model of the inventory management and can be presented as follows :

$$C = \sqrt{\frac{2FT}{r}}$$

where, C = Cash required each time to restore balance to minimum cash

F = Total cash required during the year

T = Cost of each transaction between cash and marketable securities

r = Rate of interest on marketable securities.

As per Baumol's Model, the firm should start each period with the cash balance equalling 'C' and spend gradually until its balance comes to zero. At this time, the firm should replenish the cash equalling 'C' from the sale of marketable securities. The model can be presented in a graphical form also.

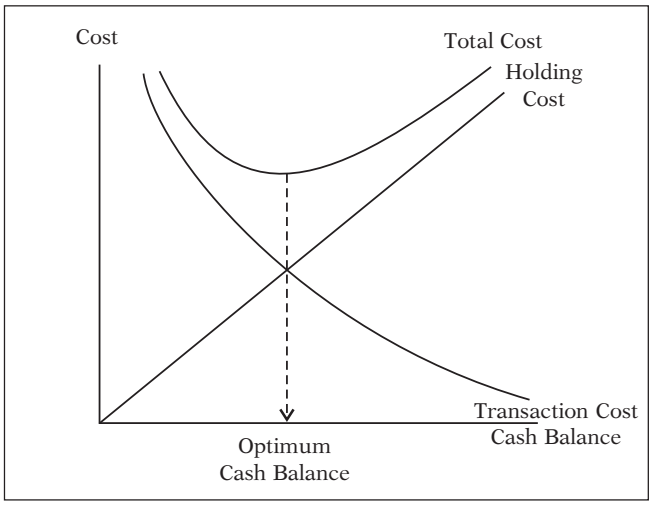

FIG. 14.2 : DETERMINATION OF OPTIMUM CASH BALANCE.

The cash balance being maintained by the firm and the average cash balance have been depicted in the Figure 14.3.

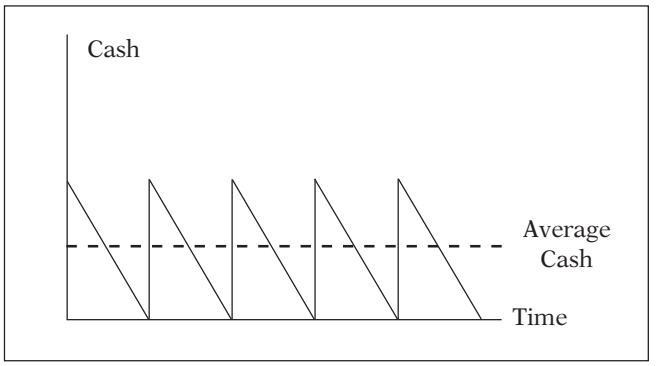

FIG. 14.3 : CASH BALANCE ACCORDING TO BAUMOL'S MODEL.

Figure 14.2 shows the determination of optimum cash balance at a level at which the holding cost and the transaction cost are optimized.

The Figure 14.3 shows the resultant position of cash balance with the firm. Suppose a firm has total cash need of ₹ 5,00,000 per annum, it's rate of interest is 15% and every time it has to pay ₹ 25 to enter into a transaction of marketable securities, then the optimum cash it requires every time and which is also to equal to the maximum cash level of the firm may be found as follows :

$$C = \sqrt{\frac{2 \times 25 \times 5,00,000}{.15}} = ₹\,12,910$$

Limitations of the Model: The Baumol's model suffers from the following shortcomings :

(*i*) The model assumes a constant rate of use of cash. This is a hypothetical assumption. Generally the cash outflows in any firm are not regular and hence this model may not give correct results.

(*ii*) The transaction cost will also be difficult to be measured since these depend upon the type of investment as well as the maturity period.

In spite of the limitations, the model has a theoretical value. It gives an idea as to how the holding cost and transaction cost should be optimized by the firm. The cash balance being maintained by the firm should be a level close to optimum level as given by the model so that the total cost is minimized.

Miller-Orr Model : Miller and Orr (1966) have expanded the Baumol's model which is not applicable if the demand for cash is not steady. In case, uncertainty over cashflows is large, the inventory type model cannot be used. If balances fluctuate randomly, then a stochastic model can be used to set control limits. The Miller-Orr model argues that changes in cash balance over a given period are random in size as well as in direction. The cash balance of a firm may fluctuate irregularly over a period of time. The model assumes (*i*) out of the two assets *i.e.*, cash and marketable securities, the latter has a marginal yield, and (*ii*) transfer of cash to marketable securities and *vice-a-versa* is possible without any delay but of course of at some cost.

The model has specified two control limits for cash balance. An upper limit, H, beyond which cash balance need not be allowed to go and a lower limit, L, below which the cash level is not allowed to reduce. The cash balance should be allowed to move within these limits. If the cash level reaches the upper control limit, H, then at this point, a part of the cash should be invested in marketable securities in such a way that the cash balance comes down to a pre-determined level called the return level, R. If the cash balance reaches the lower level, L then sufficient marketable securities should be sold to realize cash so that the cash balance is restored to the return level, R. No transaction between cash and marketable securities is undertaken so long as the cash balance is between the two limits of H and L. The Miller-Orr model has been presented in Figure 14.4.

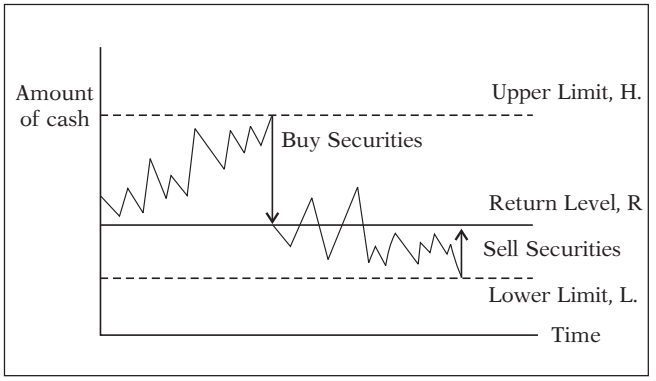

FIG. 14.4 : MILLER-ORR MODEL.

The spread between the lower and the upper limit computed by the model is that which minimizes the sum of transaction cost and the interest cost. The firm buys securities when it gets to the upper level and reduces its cash balance to the return level; and sells securities when it gets to the lower limit and raises its cash balance to the same point. The model requires three steps. The first step involves specifying a minimum cash balance, which comprises the lower limit for the cash balance (for some firms, it may be zero). The second step, involves estimating the variability in future cash flows. This could be assessed on the basis of past experience of the firm. The third step involves computing the spread as a function of the variability, the transaction cost and the market interest rate. This spread is added to the lower cash limit in order to find out the upper cash limit for the firm.

The Miller-Orr model has a superiority over the Baumol's model. The latter assumes constant need and constant rate of use of funds, the Miller-Orr model, on the other hand, is more realistic and maintains that the actual cash balance may fluctuate between the higher and the lower limits. The model may be defined as :

$$Z = \sqrt[3]{\frac{3TV}{4i}}$$

or $$Z = [3TV/4i]^{1/3}$$

where, T = Transaction cost of conversion

V = Variance of daily cash flows, and

i = Daily % interest rate on investments.

If the firm take 'L' to be lower limit of cash balance, then the return level may be defined as R = L + Z, and the upper limit H is defined as H = 3Z + L. For example, if a firm has a standard deviation of ₹ 1,200 (*i.e.*, $V = \sigma^2 =$ ₹ 14,40,000) in daily cash flows, the daily earnings on the short term investment is expected at .01% and the transaction cost for each sale and purchase of securities is ₹ 20. The variable Z may be calculated as follows :

$$Z = [3TV/4i]^{1/3}$$
$$= [(3\times20\times14,40,000)/(4\times.0001)]^{1/3} = 6,000.$$

Now, if the firm has a minimum level of ₹ 1,000, then its return level, R would be ₹ 7,000 (*i.e.*, ₹ 6,000+1,000), and the upper limit, H, is 3Z+L = ₹ (3×6,000)+1,000 = ₹ 19,000. The spread between the upper and the lower limit is ₹ 18,000 (*i.e.*, 19,000–1,000). So, long as the firm has cash balance within the range of ₹ 1,000 and ₹ 19,000, it need not worry. However, as soon as the cash balance touches the lower level of ₹ 1,000, the firm should immediately sell off some securities to realize at least of ₹ 6,000 so that the cash level is returned to ₹ 7,000. Similarly, if the cash balance touches the level of ₹ 19,000, the firm should buy enough marketable securities to bring the cash level to ₹ 7,000.

MANAGEMENT OF MARKETABLE SECURITIES

The cash and marketable securities are in fact two sides of the same coin. The two are closely related and therefore, the cash management should take care of the investment in marketable securities also. The marketable securities are the short term money market instruments that can easily be converted into cash. As the marketable securities are quickly convertible into cash, the two are often regarded as substitute and so the marketable securities are considered as a part of liquid assets. The firm can hold a minimum level of cash and can procure additional cash as and when required from the sale of marketable securities. The cash balance earns no explicit return and therefore, any cash balance in excess of minimum cash balance may be invested in marketable securities, as the latter earns some return as well as provide opportunities to be converted easily with virtually no loss of time.

A firm should maintain a minimum cash balance equal to its requirements for the normal transactions. However, the cash requirement of precautionary nature *i.e.*, to meet unpredictable financial needs may be maintained in the form of marketable securities. Whenever a need arise, cash may be obtained by selling these securities. Similarly, the excess cash balance held by the firm to meet temporary increase in cash requirement may also be invested in marketable securities. Thus, at any time, cash balance which is not immediately required, may be invested in marketable securities so that a return can be earned until it is required. Obviously, the return available is an important criterion while selecting the marketable securities, however, there are several other factors which should also be considered. Some of the factors determining the selection of marketable securities are as follows :

1. **Maturity :** The length of time for which the excess cash is expected to be available should be matched with the maturity of the marketable securities. If the firm invests money for a period longer than the period of cash availability, then the firm will be running risk of not getting cash when required, though it may be getting higher returns on these securities. In order to avoid any chance of financial distress, the firm should invest excess cash only for a period slightly shorter than the excess cash availability period. This will ensure the sufficient cash balance well before the requirement arises.
2. **Liquidity and Marketability :** Liquidity refers to the ability to transform a security into cash. Should an unforeseen event require that a significant amount of cash be immediately available, then a sizable portion of the portfolio might have to be sold. The marketable securities, though

by nature, are all marketable, still care must be taken that the selected investment must be easily, speedily and conveniently marketable. The marketability is an important consideration as sometimes, the cash realization may be required before the maturity date. The marketability feature also include the time gap required for sale of securities and the transaction costs of the sale. The liquidity varies from one type of securities to an other. Greater liquidity implies faster speed at which securities can be converted into cash. The speed of convertibility into cash will ensure, first, the prompt cash and second, realization at current market price.

The financial manager wants the cash quickly and will not like to accept a large price concession in order to convert the securities. Thus, in the formulation of preferences for the inclusion of particular instruments in the portfolio, the financial manager must consider (*a*) the period needed to sell the securities, and (*b*) the likelihood that the security can be sold at or near its prevailing market price.

3. **The Default Risk :** The risk associated with a loss in value of amount (principal) invested in marketable securities is probably the most important aspects of the selection process. The primary motive while selecting a marketable securities is that the firm should be able to get back the cash when needed. The firm should select only those securities which have no risk of default of interest or principal recovery. The financial manager should be ready to sacrifice even higher returns. So, only those securities that can be easily converted into cash without experiencing any risk in principal recovery are the candidates for short term investments. The rule for selection of marketable securities is to invest in less risky securities and be ready to sacrifice extra return for the sake of safety. It must be understood that the firm would be better off in keeping the cash balance than to take a risk of reduction in principal amount by investing in risky marketable securities.
4. **Yield :** Another selection criterion for marketable securities is the yield that is available on different assets. This criterion involves an evaluation of the risks and benefits inherent in different securities. If a given risk is assumed, such as lack of liquidity, a higher yield may be expected on the less-liquid investments.

Types of Marketable Securities : There are many types of marketable securities available in the financial market, these are all money market instruments and are liquid and can be used by a firm for its better management of excess cash. Some of these are :

(*a*) **Bank Deposits :** All the commercial banks are offering short term deposit schemes at varying rate of interest depending upon the deposit period. A firm having excess cash can make a deposit for even a short period of few days only. These deposits provide full safety, facility of premature retirement and a comfortable return.

(*b*) **Inter-corporate Deposits :** A firm having excess cash can make a deposit with other firms also. When a company makes a deposit with another company, such deposit is known as inter-corporate deposit. These deposits are usually for a period of three months to one year. Higher rate of interest is an important characteristic of these deposits. However, these are generally unsecured and the lack of safety is the main deficiency of this type of short term investment.

(*c*) **Bill Discounting :** A firm having excess cash can also discount the bills of other firms in the same way as the commercial banks do. On the bill maturity date, the firm will get the money. However, the bill discounting as a marketable securities is subject to 2 constraints : (*i*) the safety of this investment depends upon the credit rating of the acceptor of the bill, and (*ii*) usually, the premature retirement of bills is not available.

(*d*) **Treasury Bills :** The treasury bills or T-Bills are the bills issued by the Reserve Bank of India for different maturity periods. These bills are highly safe investment and are easily marketable. These treasury bills usually have a vary low level of yield and that too in the form of difference purchase price and selling price as there is no interest payable on these bills.

POINTS TO REMEMBER

- Cash Management refers to management of cash and bank balance or in a broader sense it is the management of cash inflows and outflows.
- Every firm must have a minimum cash. There may be different motives for holding cash. These may be Transactionary motive, Precautionary motive, or Speculative motive for holding cash.
- The objectives of cash management may be defined as meeting the cash outflows and minimizing the cost of cash balance.
- The cash needs, however depend upon the cash cycle, pattern of inflows and outflows, cost of cash balance and other factors.
- Cash Budget is the most important technique for planning the cash movement. It is a summary of cash inflows and outflows during a particular period. In the cash budget all expected receipts and payments (for the budget period) are noted to find out the cash shortage or surplus during that period.
- Concentration banking. Lock box system and Float management are some of the techniques of managing the cash inflows and outflows.
- Optimum level of cash balance is the balance which the firm should have in order to minimise the cost of maintaining cash.
- Baumol's model gives an optimum cash balance which aims at minimising the total cost of maintaining cash.
- The Miller-Orr model says that a firm should maintain its cash balance within a range of lower and higher limit.

GRADED ILLUSTRATIONS

Illustration 14.1

You are required to find out the Cash inflows and Outflows for the first six months on the basis of the following information : Sales on credit, variable costs and wages are budgeted as follows (the November and December figures of the previous year being the actual figures for those months) :

Month	Credit Sales (₹)	Variable Cost (₹)	Wages (₹)
November, 2013	10,000	7,000	1,000
December	12.000	7,500	1,100
January, 2014	14,000	8,000	1,200
February	13,000	7,700	1,000
March	10,000	7,000	1,000
April	12,000	7,500	1,100
May	13,000	7,750	1,200
June	16,000	8,750	1,300

Fixed expenses amount to ₹ 1,500 per month, and the half year's preference dividend of ₹ 1,400 is due on June 30. Advance tax amounting to ₹ 8,000 is payable in January and progress payment under a building contract are due as follows : March 31, ₹ 5,000; and May 31, ₹ 6,000.

The terms on which goods are sold are net cash in the month following delivery. Variable costs are payable in the month following that in which they are incurred, and 50% are subject to 21/2 discount, and the balance are net. It is found that 75% of debtors to whom sales are made pay within the period of credit, and the remainder do not pay until the following month. The company pays all its accounts promptly.

Solution :

	Jan. (₹)	Feb. (₹)	March (₹)	April (₹)	May (₹)	June (₹)
A. Cash inflows						
Collection from credit sales						
(*i*) First month following sales (75% of sales)	9,000	10,500	9,750	7,500	9,000	9,750
(*ii*) Second month following sales (25% of sales)	2,500	3,000	3,500	3,250	2,500	3,000
Total cash receipts	11,500	13,500	13,250	10,750	11,500	12,750
B. Cash outflows						
Fixed expenses	1,500	1,500	1,500	1,500	1,500	1,500
Preference dividend	—	—	—	—	—	1,400
Advance tax	8,000	—	—	—	—	—
Payment under building contract	—	—	5,000	—	6,000	—
Variable costs (VC)						
(*i*) 50% VC @ 2.5% discount	3,656	3,900	3,754	3,412	3,656	3,778
(*ii*) 50% VC at no discount	3,750	4,000	3,850	3,500	3,750	3,875
Wages (paid same month)	1,200	1,000	1,000	1,100	1,200	1,300
Total cash payments	18,106	10,400	15,104	9,512	16,106	11,853
Surplus (deficiency) (A–B)	(6,606)	3,100	(1,854)	1,238	(4,606)	897

Illustration 14.2

Prepare monthly cash forecast for the company XYZ Ltd. for the quarter ending 31st March, from the following details :

(*i*) Opening balance as on 1st January is ₹ 22,000.

(*ii*) Its estimated sale for the month of January and February ₹ 1,00,000 each and for the month of March is ₹ 1,20,000. The sale for November and December of the previous year have been ₹ 1,00,000 each.

(*iii*) Cash and credit sales are estimated 20% and 80% respectively.

(*iv*) The receivables from credit sales are expected to be collected as follows : 50% of the receivable on an average of one month from the date of sales; and balance 50% after two months from the date of sale. No bad debts on the realization of sales.

(*v*) Other anticipated receipt is ₹ 5,000 from the sale of machine in March.

The forecast of payment is as follows :

(*a*) The purchase of materials worth ₹ 40,000 in January and February and materials worth ₹ 48,000 in March.

(*b*) The payments for these purchases are made approximately a month after the purchase. The purchases for December of the previous year have been ₹ 40,000 for which the payment will be made in January.

(*c*) Miscellaneous cash purchase of ₹ 2,000 per month.

(*d*) The wages payments are expected to be ₹ 15,000 per month.

(*e*) Manufacturing expenses are expected to be ₹ 20,000 per month.

(*f*) General selling expenses are expected to be ₹ 10,000 per month.

(*g*) A machine worth ₹ 50,000 is proposed to be purchased on cash in March.

Solution :

CASH BUDGET FOR THE PERIOD JANUARY-MARCH

	January	February	March
Opening Cash	₹ 22,000	₹ 35,000	₹ 48,000
Cash Inflows :			
Cash sales	20,000	20,000	24,000
Debtors collected	80,000	80,000	80,000
Sale of machine	—	—	5,000
Total Cash (A)	1,22,000	1,35,000	1,57,000
Cash Outflows :			
Cash Purchases	2,000	2,000	2,000
Payment to creditors	40,000	40,000	40,000
Wages	15,000	15,000	15,000
Manufacturing expenses	20,000	20,000	20,000
General selling expenses	10,000	10,000	10,000
Purchase of machine	—	—	50,000
Total Outflows (B)	87,000	87,000	1,37,000
Cash balance (A–B)	35,000	48,000	20,000

Illustration 14.3

Lal & Co. has given the forecast sales for January 2016 to July 2016 and actual sales for November and December 2015 as under. With the other particulars given, prepare a Cash Budget for the months *i.e.*, from January to May 2016.

(*i*) Sales

November 2015	₹ 1,60,000
December 2015	1,40,000
January 2016	1,60,000
February 2016	2,00,000
March 2016	1,60,000
April 2016	2,00,000
May 2016	1,80,000
June 2016	2,40,000
July 2016	2,00,000

(*ii*) Sales 20% cash, and 80% credit, credit period two months.

(*iii*) Variable expenses 5% on turnover, time lag half month.

(*iv*) Commission 5% on credit sale payable in two months.

(*v*) Purchases are 60% of the sales. Payment will be made in 3rd month of purchases.

(*vi*) Rent ₹ 6,000 paid every month.

(*vii*) Other payments : Fixed assets purchases - February ₹ 36,000 and March ₹ 1,00,000; Taxes - April 40,000.

(*viii*) Opening cash balance ₹ 50,000.

Solution : **CASH BUDGET FOR JANUARY-MAY, 2016** **(Figures in ₹)**

	Jan.	Feb.	March	April	May
Opening balance	50,000	94,100	1,05,500	48,100	65,100
Cash inflows :					
Sales Cash	32,000	40,000	32,000	40,000	36,000
Credit	1,28,000	1,12,000	1,28,000	1,60,000	1,28,000
Total cash (A)	2,10,000	2,46,100	2,65,500	2,48,100	2,29,100
Outflows :					
Creditors	96,000	84,000	96,000	1,20,000	96,000
Variable expenses	7,500	9,000	9,000	9,000	9,500
5% Commission	6,400	5,600	6,400	8,000	6,400
Rent	6,000	6,000	6,000	6,000	6,000
Fixed assets	—	36,000	1,00,000	—	—
Taxes	—	—	—	40,000	—
Total cash outflows (B)	1,15,900	1,40,600	2,17,400	1,83,000	1,17,900
Balance (A–B)	94,100	1,05,500	48,100	65,100	1,11,200

The outflows on account of Variable expenses have been calculated as follows: The Variable expenses are payable with a time lag of half a month. So, during the month of January 2016, payment would be made in respect of half month sales of January 2016 and half month sales of December 2015. So,- payment would be 5% of [1/2(1,40,000)+1/2 (1,60,000)]. Similarly, payment for other months can also be calculated.

Illustration 14.4

Prepare a Cash Budget of XYZ Ltd., on the basis of the following information for the six months commencing April, 2016.

(*i*) Cost and Prices remain unchanged and firm maintains a minimum cash balance of ₹ 4,00,000 for which bank overdraft may be availed if required.

(*ii*) Cash Sales are 25% of the total sales and balance 75% will be credit sales. 60% of credit sales are collected in the month following the sales, balance 30% and 10% in the two following months thereafter. No bad debts are anticipated.

(*iii*) Sales forecasts are as follows :

2016		2016	
January	₹ 12,00,000	June	₹ 8,00,000
February	13,33,333	July	12,00,000
March	16,00,000	August	10,00,000
April	6,00,000	September	8,00,000
May	8,00,000	October	12,00,000

(*iv*) Gross Profit Margin 20%.

(*v*) Anticipated Purchases and wages for the year 2016 are as follows :

	Purchases	Wages
April	₹ 6,40,000	₹ 1,20,000
May	6,40,000	1,60,000
June	9,60,000	2,00,000
July	8,00,000	2,00,000
August	6,40,000	1,60,000
September	9,60,000	1,40,000

(*vi*) Quarterly Interest payable ₹ 30,000; Rent payable ₹ 8,000 per month.

(*vii*) Capital expenditure expected in September is ₹ 1,20,000.

Solution :

CASH BUDGET-APRIL TO SEPTEMBER 2016

(₹ in lacs)

	April	May	June	July	Aug.	Sept.
A. Cash Inflows:						
Sales Realization						
Cash Sales	1.50	2.00	2.00	3.00	2.50	2.00
Credit Sales	11.10	7.30	6.15	5.85	7.80	7.80
Total inflows	12.60	9.30	8.15	8.85	10.30	9.80
B. Cash Outflows :						
Materials	6.40	6.40	9.60	8.00	6.40	9.60
Wages/Salaries	1.20	1.60	2.00	2.00	1.60	1.40
Int. on Debentures	—	—	0.30	—	—	0.30
Capital Expenditure	—	—	—	—	—	1.20
Rent	0.08	0.08	0.08	0.08	0.08	0.08
Total Outflows	7.68	8.08	11.98	10.08	8.08	12.58
Opening Balance	4.00	8.92	10.14	6.31	5.08	7.30
Closing Balance	8.92	10.14	6.31	5.08	7.30	4.52

Working Notes :

Collection from Credit Sales :

(₹ in lacs)

	April	May	June	July	Aug.	Sept.
Credit Sales	4.50	6.00	6.00	9.00	7.50	6.00
Collections—						
60% of preceding month	7.20	2.70	3.60	3.60	5.40	4.50
30% of next preceding month	3.00	3.60	1.35	1.80	1.80	2.70
10% of next preceding month	0.90	1.00	1.20	0.45	0.60	0.60
	11.10	7.30	6.15	5.85	7.80	7.80

Illustration 14.5

Following is the sales forecast for first five months of the coming year :

Months	Sales
April	₹ 40,000
May	45,000
June	55,000
July	60,000
August	50,000

Other data:

(*i*) Debtors' and Creditors' balance at the beginning of the year are ₹ 30,000 and ₹ 14,000 respectively. The balance of other relevant assets and liabilities are :

Cash Balance	₹ 7,500
Stock	₹ 51,000
Accrued Sales Commission	₹ 3,500

(*ii*) 40% sales are on cash basis. Credit sales are collected in the month following the sale.

(*iii*) Cost of sales is 60 per cent of sales.

(*iv*) The only other variable cost is a 5% commission to sales agents. The Sales commission is paid in a month after it is earned.

(*v*) Inventory (Stock) is kept equal to sales requirements for the next two months budgeted sales.

(*vi*) Trade creditors are paid in the following month after purchases.

(*vii*) Fixed costs are ₹ 5,000 per month including ₹ 2,000 depreciation.

You are required to prepare a Cash Budget for the months of April, May, and June respectively.

[B.Com. (H), D.U., 2009]

Solution:

CASH BUDGET

	April	May	June
Cash Balance	₹ 7,500	₹ 33,000	₹ 37,000
Receipts :			
Cash Sales	16,000	18,000	22,000
Collection from Debtors	30,000	24,000	27,000
Total	53,500	75,000	86,000

	April	May	June
Payments :			
Creditors	14,000	33,000	36,000
Fixed Cost	3,000	3,000	3,000
Sales Commission	3,500	2,000	2,250
Total	20,500	38,000	41,250
Closing Cash Balance	33,000	37,000	44,750

Working Notes :

	April	May	June	July	August
Sales	₹ 40,000	₹ 45,000	₹ 55,000	₹ 60,000	₹ 50,000
Cash Sales 40%	16,000	18,000	22,000	24,000	20,000
Credit Sales	24,000	27,000	33,000	36,000	30,000
Cost of Sales @ 60%	24,000	27,000	33,000	36,000	30,000
Required Closing Stock	60,000	69,000	66,000		
Total goods	84,000	96,000	99,000		
– Opening Stock	51,000	60,000	69,000		
Therefore, Purchases	33,000	36,000	30,000		
Payment to Creditors	14,000	33,000	36,000		

Assumption : Fixed costs are over and above the costs of sales.

Illustration 14.6

From the following information prepare the cash budget of a business firm for the month of April:

(*a*) The firm makes 20% cash sales. Credit sales are collected 40%, 30%, 25% in the month of sales, a month after and second month after sales, respectively. The remaining 5% become bad debts.

(*b*) The firm has a policy of buying enough goods each month to maintain its inventory at 2½ times the following month's budgeted sales.

(*c*) The firm is entitled to 2% discount on all of its purchases if bills are paid within 15 days and the firm avails all such discounts. Creditors are then equal to ½ of that month's net purchases.

(*d*) Cost of goods sold, without considering the 2% discount, is 50% of selling prices. The firm records inventory net of discount. Other information:

Sales	Amount (₹)
January (actual)	1,00,000
February (actual)	1,20,000
March (actual)	1,50,000
April (projected)	1,70,000
May (projected)	1,40,000
Inventory on 31st March,	2,25,400
Cash on 31st March,	30,000
Gross purchases in March	1,00,000

Selling, General and Administrative expenses budgeted for April are ₹ 45,000 (which include ₹ 10,000 depreciation).

Solution :

CASH BUDGET FOR THE MONTH OF APRIL

A. Cash Inflows :		
Balance in the beginning (1st April)		₹ 30.000
Collection from sales :		
(*i*) Cash sales (20% × ₹ 1,70,000)		34,000
(*ii*) Collection from debtors :		
For February sales (25% × ₹ 96,000)	24,000	
For March sales (30% × ₹ 1,20,000)	36,000	
For April sales (40% × ₹ 1,36,000)	54,400	1,14,400
Total cash receipts		1,78,400
B. Cash Outflows :		
Payment for purchases :		
March (₹ 1,00,000 × 98% × ½)	49,000	
April (₹ 29,400 × ½)	14,700	63,700
Selling, General and Admn. Exp. (₹ 45,000–10,000)		35,000
Total cash outflows		98,700
Cash Balance		79,700

Working Note :

Purchases during April :

	Gross (₹)	Net (₹)
Desired ending inventory-Gross (₹ 1,40,000 × 50% × 2.5)	1,75,000	1,71,500
Add cost of sales in April-Gross (₹ 1,70,000 × 50%)	85,000	83,300
Total requirements	2,60,000	2,54,800
Less beginning inventory-Gross (₹ 2,25,400 × 100/98)	–2,30,000	–2,25,400
Required purchases	30,000	29,400

Illustration 14.7

'X' started the business on June 1, 2016 with a cash capital of ₹ 60,000. He intends to purchase free hold property (₹ 40,000) Equipment (₹ 10,000) and a Vehicle for ₹ 6,000 during June, 2016. The firm also intends to purchase stock of ₹ 22,000 on credit on June 1, 2016. The Firm has produced the following estimates:

(*i*) Sales for June will be ₹ 8,000 and will increase at the rate of ₹ 3,000 per month until September. In October sales will rise to ₹ 22,000 and in subsequent months sales will be maintained at this figure.

(*ii*) The gross profit percentage on goods sold will be 25%.

(*iii*) There is a risk that supplies of trading stock will be interrupted towards the end of the accounting year. The company, therefore, intends to build up its initial level of stock (*i.e.,* ₹ 22,000) by purchasing ₹ 1,000 of stock each month in addition to the monthly purchases necessary to satisfy monthly sales. All purchases of stock (including the initial stock) will be on one month credit.

(*iv*) Sales will be divided equally between cash and credit sales. Credit customers are expected to pay two months after the sale is agreed.

(*v*) Wages and salaries will be ₹ 900 per month. Other overheads will be ₹ 500 per month for the first our months and ₹ 650 thereafter. Both types of expense will be payable when incurred.

(*vi*) Sales will be generated by salesmen who will receive 4% commission on sales. The commission is payable one month after it has occurred.

(*vii*) The company intends to purchase further equipment in November 2016 for ₹ 7,000 cash.

(*viii*) Depreciation is to be provided at the rate of 5% per annum on freehold property and 20% per annum on equipment.

Prepare a cash budget for the firm for the six month period to 30 November, 2016.

Solution :

MONTHLY CASH BUDGET FOR THE 6 MONTH ENDING 30 NOVEMBER, 2016

	June	July	August	September	October	November
Opening Cash	₹ 60,000	₹ 6,600	₹ –18,620	₹ –18,710	₹ –18,710	₹ –16,150
Receipts :						
Cash Sales	4,000	5,500	7,000	8,500	11,000	11,000
Credit Sales	—	—	4,000	5,500	7,000	8,500
Total Cash (A)	64,000	12,100	–7,620	–4,710	–170	3,350
Payments:						
Freehold Property	40,000	—	—	—	—	—
Equipment	10,000	—	—	—	—	7,000
Vehicle	6,000	—	—	—	—	—
Wages	900	900	900	900	900	900
Overheads	500	500	500	500	650	650
Purchases	—	29,000	9,250	11,500	13,750	17,500
Commission @ 4%	—	320	440	560	680	880
Total Payments (B)	57,400	30,720	11,090	13,460	15,980	26,930
Closing Cash Balance (A-B)	6,600	–18,620	–18,710	–18,170	–16,150	–23,580

Note : Negative balances refer to bank over draft.

Illustration 14.8

Prepare cash budget for April-Oct. 2016 from the following information relating to Shah Agencies, a trading concern:

BALANCE SHEET AS ON 31ST MARCH, 2016

Liabilities	Amount	Assets		Amount
Proprietor's Capital	₹ 1,00,000	Cash		₹ 20,500
Outstanding		Stock		50,500
Liabilities	17,000	Sundry debtors		26,000
		Furniture	₹ 25,000	
		–Dep.	5,000	20,000
	1,17,000			1,17,000

Sales and salaries for different months are expected to be as under :

Months	Sales	Salaries
April	30,000	3,000
May	52,000	3,500
June	50,000	35,000
July	75,000	4,000
August	90,000	14,000
September	35,000	3,000
October	25,000	3,000

The other expenses per month are : Rent ₹ 1,000, Depreciation ₹ 1,000, Misc. Expenses ₹ 500 and Commission 1% of sales.

Of the sales, 80% is on credit and 20% for cash. 70% of the credit sales are collected in one month and the balance in two months. Debtors on March 31, 2016 represent ₹ 6,000 in respect of sales of February and ₹ 20,000 in respect of sales of March. There are no debt losses. Gross profit on sales on an average is 30%. Purchases equal to the next month's sales are made every month and they are paid during the month in which they are made. The firm maintains a minimum cash balance of ₹ 10,000. Cash deficiencies are made up bank loans which are repaid at the earliest available opportunity and cash in excess of ₹ 15,000 is invested in securities (Interest on bank loans and securities is to be ignored). Outstanding liabilities remain unchanged.

Solution :

CASH BUDGET FOR APRIL TO OCTOBER, 2016

	April ₹	May ₹	June ₹	July ₹	August ₹	Sept. ₹	Oct. ₹
Opening Balance	20,500	10,000	10,000	10,000	10,000	10,000	15,000
A. Cash Inflow:							
Sales	26,000	33,300	46,320	55,480	72,000	75,400	46,200
Total	46,500	43,200	56,320	65,480	82,000	85,400	61,200
B. Cash Outflow:							
Purchase	36,400	35,000	52,500	63,000	24,500	17,500	17,500
Salaries	3,000	3,500	35,000	4,000	14,000	3,000	3,000
Rent	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Commission	300	520	500	750	900	350	250
Misc. Expenses	500	500	500	500	500	500	500
Total	41,200	40,520	89,500	69,250	40,900	22,350	22,250
Cash Balance	5,300	2,680	–33,180	–3,770	41,100	63,050	38,950
Desired cash	10,000	10,000	10,000	10,000	10,000	15,000	15,000
Bank Overdraft	4,700	7,320	43,180	13,770	—	—	—
Repayment of O/D	—	—	—	—	31,100	37,870	—
Investment	—	—	—	—	—	10,180	23,950

Working Notes :

1. Out of total sales, 20% is cash sales, balance 80% is credit sales. Out of credit sales, 70% is receivable after one month and balance 30% after two months. Thus,

Cash Sales (20%)	20%
Receivable after one month (70% of 80%)	56%
Receivable after two months (30% of 80%)	24%
	100%

Collection from Sales :

	April ₹	May ₹	June ₹	July ₹	August ₹	Sept. ₹	Oct. ₹
Total Sales	30,000	52,000	50,000	75,000	90,000	35,000	25,000
Cash Sales (20%)	6,000	10,400	10,000	15,000	18,000	7,000	5,000
56% of previous month	14,000	16,800	29,120	28,000	42,000	50,400	19,600
24% of next preceding month	6,000	6,000	7,200	12,480	12,000	18,000	21,600
Sales collection	26,000	33,200	46,320	55,480	72,000	75,400	46,200

2. Since no sales of November has been specified, the sales of November has been taken as same as in October *i.e.,* ₹ 25,000 in order to find out the payment for purchases.
3. Since gross margin is 30% of sales, the purchase is 70% of sales. Payment for purchase is (70% of sales of next month) to be made in the month of purchase.

Illustration 14.9

Find out the optimum cash balance as per Baumols Model for the following :

Annual cash needed	₹ 2,40,000
Transaction cost	₹ 100 per conversion
Interest rate	₹ 12% p.a.

What are the opportunity costs of holding cash, the transaction cost and the total costs. What these would be if cash held is ₹ 15,000 or ₹ 25,000 ?

Solution : Optimum cash balance as per Baumol Model is :

$$C = \sqrt{\frac{2FT}{r}} = \sqrt{\frac{2 \times 2,40,000 \times 100}{.12}}$$

$$= ₹\ 20,000$$

Average Cash balance	₹ 10,000 (*i.e.,* 20,000 ÷ 2)
Interest Cost @ 12%	₹ 1,200
No. of transactions (₹ 2,40,000 ÷ 20,000)	12
Transaction cost (12 × 100)	₹ 1,200
Total cost (₹ 1,200 + 1,200)	₹ 2,400

If the cash held is ₹ 15,000 or ₹ 25,000, different costs would be :

	Cash Balance ₹ 15,000	Cash Balance ₹ 25,000
Average Cash	₹ 7,500	₹ 12,500
Interest Cost @ 12%	₹ 900	₹ 1,500

	Cash Balance ₹ 15,000	Cash Balance ₹ 25,000
No. of transactions	16	9.6
Transaction cost @ ₹ 100 each	₹ 1,600	₹ 960
Total Cost	₹ 2,500	₹ 2,460

In both cases, the total annual cost will be more than the cost as per Baumol's Model.

Illustration 14.10

Stapler Kanga Ltd. receives cash at gradual and steady rate of ₹ 3,50,000 p.a. The cash can be invested by the company to give a return of 12% p.a. However, every time, it invests, it has to meet transaction expenses of ₹ 50 *plus* 1% brokerage of the amount invested. Another investment broker has approach the company to take up the investment work. He has offered to charge ₹ 100 per transaction *plus* 0.8% of the amount invested. Should the company accept the offer ?

Solution :

In this case, the company does not invest the cash immediately. The reason being that there is a fixed transaction cost every time. The company should find out the amount to be invested and the total annual cost in both options.

	Existing	New
Annual Cash generated	₹ 3,50,000	₹ 3,50,000
Transaction Cost (per)	₹ 50	₹ 100
Brokerage	1%	0.8%
Rate of Interest	12%	12%
Optimum investment (Baumol's total)	$\sqrt{\frac{2\times 3,50,000\times 50}{.12}}$ = ₹ 17,078	$\sqrt{\frac{2\times 3,50,000\times 100}{.12}}$ = ₹ 24,152
No. of transactions per year	20.49	14.49
Average Cash held	₹ 8,539	₹ 12,076
Total holding cost @ 12%	1,025	₹ 1,449
Total Transaction cost @ ₹ 50/100 each	1,025	1,449
Brokerage (Annual) @ 1%/.8%	3,500	2,800
	5,550	5,698

The cost is likely to increase in the new scheme. So, the company should continue with the existing arrangement.

Illustration 14.11

Cash flows of Green Packs Ltd. behave in a random manner. Find out the 'Return Point' and 'Upper Limit', as per Miller-Orr Model, on the basis of the following information:

(*i*) Cost of effecting a marketable securities transaction is ₹ 200.

(*ii*) Annual yield on marketable securities is 12%.

(*iii*) Standard deviation of daily cash balance is ₹ 500.

(*iv*) The minimum cash balance is ₹ 5,000.

Also find out average cash balance.

Solution :

'Z' value as per MO Model is:

$$Z = \sqrt[3]{\frac{3TV}{4i}}$$

where, T = Transaction cost, ₹ 2,000

V = Variance of daily cash requirement, $(5,000)^2$

i = Daily rate of interest, (.12 ÷ 365) = .0328%.

Now, $Z = \sqrt[3]{\frac{3\times 2,000\times 2,50,000}{4\times .000328}} = \sqrt[3]{114329268292}$

= 4853

Now, Return Level, R = ₹ 5,000 + ₹ 4,853 = ₹ 9,853

Upper Level, U = ₹ 5,000 + 3(4,853) = ₹ 19,559.

Illustration 14.12

Rama East India Ltd. has a standard deviation of monthly net cash flows of ₹ 200. It's transaction cost of converting cash into marketable securities is ₹ 10 and the interest is 1% per month. The minimum cash balance required is ₹ 100. Set out the Upper, Lower and Return limit for the firm.

Solution :

In the given case, the standard deviation of cashflows and the rate of interest, both are given in terms of monthly time unit. The MO model has been applied on monthly time unit basis instead of daily time unit basis. The given information can be presented as follows :

T = ₹ 10

V = $(200)^2$ = ₹ 40,000

i = 1% per month

L = ₹ 100

Now, $Z = \sqrt[3]{\frac{3TV}{4i}} = \sqrt[3]{\frac{3\times 10\times 40,000}{.01\times 4}}$ = ₹ 311

The relevant limits can be ascertained as follows :

Lower limit, L = ₹ 100

Z = ₹ 311

Return Level, R = Z + L = ₹ 411

Upper Level, U = 3Z + L = ₹ 1,033

OBJECTIVE TYPE QUESTIONS

State whether each of the following statements is ***True (T)*** *or* ***False (F).***

(*i*) Management of cash means management of cash inflows.

(*ii*) Cash is the most important but least earning current asset.

(*iii*) Cash management always attempts at minimizing the cash balance.

(*iv*) Cash cycle is equal to operating cycle for a firm.

(*v*) Receipts and disbursement method of preparation of cash budget is the most widely used method.

(*vi*) Concentration banking is a method of controlling cash outflows.

(*vii*) Baumol's model of cash management assumes a constant rate of use of cash.

(*viii*) Baumol's model attempts at optimization of cash balance.

(*ix*) In cash management, expected surplus cash, if any, is not considered at all.

(*x*) Capital expenditures are not considered in cash budget.

(*xi*) Issue of share capital or debentures are taken as inflows in cash budget.

(*xii*) Conversion of debentures into share capital is equal to issue of share capital and hence it is a type of cash inflow.

[**Answers :** *(i) F, (ii) T, (iii) T, (iv) F, (v) T, (vi) F, (vii) T, (viii) T, (ix) F, (x) F, (xi) T, (xii) F*].

MULTIPLE CHOICE QUESTIONS

1. Cash Budget does not include :
- (*a*) Dividend Payable
- (*b*) Capital Expenditure
- (*c*) Issue of Capital
- (*d*) Total Sales Figure.

2. Which of the following is not a motive to hold cash?
- (*a*) Transactionary Motive
- (*b*) Precautionary Motive
- (*c*) Capital Investment
- (*d*) None of the above.

3. Cheques deposited in bank may not be available for immediate use due to :
- (*a*) Payment Float
- (*b*) Receipt Float
- (*c*) Net Float
- (*d*) Playing the Float.

4. Difference between the bank balance as per Cash Book and Pass Book may be due to :
- (*a*) Overdraft
- (*b*) Float
- (*c*) Factoring
- (*d*) None of the above.

5. Concentration Banking helps in :
- (*a*) Reducing Idle Bank Balance
- (*b*) Increasing Collection
- (*c*) Increasing Creditors
- (*d*) Reducing Bank Transactions.

6. The Transaction Motive for holding cash is for :
- (*a*) Safety Cushion
- (*b*) Daily Operations
- (*c*) Purchase of Assets
- (*d*) Payment of Dividends.

7. Which of the following should be reduced to minimum by a firm?
- (*a*) Receipt Float
- (*b*) Payment Float
- (*c*) Concentration Banking
- (*d*) All of the above.

8. Cash required for meeting specific payments should be invested with an eye on :
- (*a*) Yield
- (*b*) Maturity
- (*c*) Liquidity
- (*d*) All of the above.

9. Miller-Orr Model deals with :
- (*a*) Optimum Cash Balance
- (*b*) Optimum Finished goods
- (*c*) Optimum Receivables
- (*d*) All of the above.

10. Float management is related to :
- (*a*) Cash Management
- (*b*) Inventory Management
- (*c*) Receivables Management
- (*d*) Raw Materials Management.

11. Which of the following is not an objective of cash management ?
- (*a*) Maximization of cash balance
- (*b*) Minimization of cash balance
- (*c*) Optimization of cash balance
- (*d*) Zero cash balance.

12. Which of the following is not true of cash budget ?
- (*a*) Cash budget indicates timings of short-term borrowing
- (*b*) Cash budget is based on accrual concept
- (*c*) Cash budget is based on cash flow concept
- (*d*) Repayment of principal amount of law is shown in cash budget.

13. Baumol's Model of Cash Management attempts to :
- (*a*) Minimise the holding cost
- (*b*) Minimization of transaction cost
- (*c*) Minimization of total cost
- (*d*) Minimization of cash balance

14. Which of the following is not considered by Miller-Orr Model ?
    (*a*) Variability in cash requirement
    (*b*) Cost of transaction
    (*c*) Holding cost
    (*d*) Total annual requirement of cash.
15. Basic characteristic of short-term marketable securities :
    (*a*) High Return
    (*b*) High Risk
    (*c*) High Marketability
    (*d*) High Safety
16. Marketable securities are primarily :
    (*a*) Equity shares
    (*b*) Preference shares
    (*c*) Fixed deposits with companies
    (*d*) Short-term debt investments.

[**Answers :** *1. (d), 2.(c), 3. (b), 4. (b), 5. (b), 6. (b), 7. (a), 8. (b), 9. (a), 10. (a), 11. (c), 12. (b), 13. (c), 14. (d), 15. (c), 16. (d)*]

ASSIGNMENTS

1. Write short notes on :
   (*a*) Concentration banking. *[B.Com.(H.), D.U. 2006]*
   (*b*) Lock-box system. *[B.Com.(H.), D.U. 2006, 2013]*
   (*c*) Motives for holding cash. *[B.Com.(H.), D.U. 2013]*
   (*d*) Playing the Float.
2. What are the objectives of cash management?
3. What are the factors affecting the cash needs of a firm? *[B.Com.(H.), D.U. 2016]*
4. "Efficient cash management will aim at maximizing the availability of cash inflows by decentralizing collections and decelerating cash outflows by centralizing the disbursements"? Discuss and explain.
5. "The need for maintaining cash balance arises from the non-synchronization of the inflows and outflows of cash". Elucidate.
6. What are collection float and disbursement float ?
7. Explain the Baumol's model of cash management. *[B.Com.(H.), D.U., 2011, 2012, 2017]*
8. Discuss the Miller-Orr model for determining the cash balance for the firm. *[B.Com.(H.), D.U., 2013, 2018]*
9. "Cash budget is an important technique of cash management". Explain. What are the different methods of preparing the cash budget?
10. Explain and discuss the role of marketable securities in cash management.
11. What are the factors affecting the choice of marketable securities?
12. Define float. Distinguish between payment float and collection float. What is the objective in float management ? *[B.Com.(H.), D.U. 2014]*
13. Explain the 'non-synchronization of cash flows' and 'short costs' as factors in determining cash needs. *[B.Com.(H.), D.U. 2010]*
14. Miller-Orr Model of cash management is more realistic than Boumol's Model ? Explain *[B.Com.(H.), D.U. 2014]*

PROBLEMS

P14.1 A Ltd. started the business on 1-1-2016 with a capital of ₹ 40,000. The estimated sales and purchases for the next 6 months are as follows :

(Figures in ₹)

Particulars	January	February	March	April	May	June
Purchases	24,000	40,000	48,000	48,000	52,000	48,000
Sales	—	32,000	60,000	68,000	68,000	80,000

50% of purchases are paid for in the same month. The balance is paid during the next month. Of the sales, 40% is on cash basis. The balance is realized in the next month. Expenses of manufacture come to ₹ 8,000 every month. It purchased a machine for ₹ 12,000 during February, payment for which is made during the same month. Prepare a cash budget for the six months ended on 30-6-2016

[*Answer :* Cash balance on 30-6-2016 is ₹ 4,000].

P14.2 Prepare monthly cash budget for six months beginning April, 2016 on the basis of the following information :

(*i*) **Estimated monthly Sales are as follows :**

January	₹ 1,00,000	June	₹ 80,000
February	1,20,000	July	1,00,000
March	1,40,000	August	80,000
April	80,000	September	60,000
May	60,000	October	1,00,000

(*ii*) **Wages and Salaries are estimated to be payable as follows :**

April	₹ 9,000	July	₹ 10,000
May	8,000	August	9,000
June	10,000	September	9,000

(*iii*) Of the sales, 80% are on credit and 20% for cash. 75% of the credit sales are collected within one month and the balance in two months. There are no bad debt losses.

(*iv*) Purchases amount to 80% of sales and are made and paid for in the month preceding the sales

(*v*) The firm has 10% debentures of ₹ 1,20,000. Interest on these has to be paid quarterly in January, April and so on.

(*vi*) The firm is to make an advance payment of tax of ₹ 5,000 in July 2016.

(*vii*) The firm had a cash balance of ₹ 20,000 on April 1, 2016, which is the minimum desired level of cash balance. Any cash surplus/deficit above/below this level is made up by temporary borrowings at the end of each month (interest on these to be ignored).

[*Answer :* Cash balance at the end of each of 6 months would be ₹ 20,000. The temporary investment made are ₹ 64,000, ₹ 16,000 and ₹ 35,000 during April, May and August respectively. The liquidation of investment (*i.e.*, sale) will be required during June, July and September to the extent of ₹ 22,000, ₹ 2,000 and ₹ 9,000 respectively.]

P14.3 Based on the following information prepare a cash budget for ABC Ltd.

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Opening cash balance	₹ 10,000			
Collection from customers	1,25,000	₹ 1,50,000	₹ 1,60,000	₹ 2,21,000
Payment :				
Purchase of materials	20,000	35,000	35,000	54,200
Other expenses	25,000	20,000	20,000	17,000
Salary and wages	90,000	95,000	95,000	1,09,200
Income tax	5,000	—	—	—
Purchase of machinery	—	—	—	20,000

The company desires to maintain a cash balance of ₹ 15,000 at the end of each quarter. Cash can be borrowed or repaid in multiples of ₹ 500 at an interest of 10% per annum. Management does not want to borrow cash more than what is necessary and wants to repay as early as possible. In any event, loans cannot be extended beyond four quarters. Interest is computed and paid when repayment is made at the end of the quarter.

[*Answer :* Interest payable in 3rd and 4th quarter is ₹ 675 and ₹ 1,100. Cash balance at the end of 4th quarter is ₹ 23,825.]

P14.4 Prepare the cash budget for the three months ending 30th June, 2016 from the information given below :

(*a*)

Month	Sales	Materials	Wages	Overheads
February	₹ 14,000	₹ 9,600	₹ 3,000	₹ 1,700
March	15,000	9,000	3,000	1,900
April	16,000	9,200	3,200	2,000
May	17,000	10,000	3,600	2,200
June	18,000	10,400	4,000	2,300

(*b*) **Credit terms :** 10% sales are on cash, 50% of the credit sales are collected next month and the balance in the following month.

Creditors	Materials	2 months
	Wages	¼ month
	Overheads	½ month

(*c*) Cash and bank balance on 1st April, 2016 is expected to be ₹ 6,000.

(*d*) Plant and machinery will be installed in February 2016 at a cost of ₹ 96,000. The monthly instalments of ₹ 2,000 is payable from April onwards.

(*e*) Dividend @5% on Preference Share Capital of ₹ 2,00,000 will be paid on 1st June.

(*f*) Advance to be received for sale of vehicles ₹ 9,000 in June.

(*g*) Dividends from investments amounting to ₹ 1,000 are expected to be received in June.

(*h*) Income tax (advance) to be paid in June is ₹ 2,000.

[*Answer:* Cash balance at the end of different months is ₹ 3,950, ₹ 3,000 and ₹ 300 respectively.]

P14.5 Ashok Ball Bearings Ltd. is preparing the cash budget for the first half of year 2016. The projected sales and other items are given hereunder :

MONTHS **(Figures in ₹)**

	January	February	March	April	May	June
Projected Sales	72,000	97,000	86,000	88,000	1,05,000	1,10,000
Goods Purchased	25,000	31,000	26,000	31,000	37,000	39,000
Salaries	10,000	12,000	20,000	25,000	22,000	23,000
Overheads	6,000	6,300	6,000	6,500	8,000	8,200
General Expenses	6,000	6,000	7,500	8,900	11,000	12,000

Additional Information:

(*i*) The Company plans to acquire machines worth ₹ 28,000 and ₹ 75,000 in February and April for which payments will be made instantly. The Company also plans to take a bank loan for ₹ 40,000 during April.

(*ii*) 50% sales are on cash basis. Balance sales are collected in one month time.

(*iii*) Payment for purchase of goods and for overheads is made in the next months.

(*iv*) The Company plans to pay a dividend of ₹ 40,000 in the month of June.

(*v*) A sales commission @ 3% is payable in the month of sales.

(*vi*) Debtors and Creditor on Jan. 1, 2016 would be ₹ 20,000 and ₹ 40,000 respectively.

Prepare Cash Budget for the six month given that cash balance on Jan. 1, 2016 is ₹ 20,000.

[Answer : Closing cash balances for different months are ₹ 17,840; 22,430; 46,550; 30,010; 52,860 and ₹ 77,060 respectively.]

P14.6 The following data is collected by SRG Iron & Steel Co. for first four months of the next financial year :

	Month 1	Month 2	Month 3	Month 4
Sales	₹ 15,000	₹ 24,000	₹ 36,000	₹ 24,000
Purchase of Assets	1,200	2,000	4,000	—
Raw materials	14,000	15,000	16,000	17,000
Expenses	2,000	4,000	4,000	8,600

Additional Information :

(*i*) The opening cash balance in the beginning is expected at ₹ 12,000 and the firm wants to maintain a minimum cash balance of ₹ 5,000 at the end of each month.

(*ii*) Opening debtors for the Month I are ₹ 5,000.

(*iii*) On a average 2/3 of monthly sales are on credit basis and collected next month.

(*iv*) Borrowing, if any, may be made in the beginning of a month in the multiple of ₹ 1,000.

The repayment can be made at the end of a month together with 2% monthly interest.

Prepare cash budget for four month.

[*Answer :* Borrowing in Month I and Month II of ₹ 1,000 and ₹ 3,000. Repayment in Month III ₹ 4,180 (4,000+180). Balance at the end of Month IV is ₹ 12,020.]

P14.7 The following data pertain to a shop. The owner has made the following sales forecasts for the first 5 months of the coming year.

January	₹ 40,000
February	45,000
March	55,000
April	60,000
May	50,000

Other data are as follows :

(*a*) Debtors and creditor's balances at the beginning of the year are ₹ 30,000 and ₹ 14,000, respectively. The balances of other relevant assets and liabilities are :

Cash balance	₹ 7,500
Stock	51,000
Accrued sales commission	3,500

(*b*) 40% sales are on cash basis. Credit sales are collected in the month following sale.

(*c*) Cost of sales is 60% of sales.

(*d*) The only other variable cost is a 5% commission to sales agents. Sales commission is paid in the month after it is earned, *i.e.,* time-lag is one month; 80% sales are subject to the commission.

(*e*) Inventory (stock) is kept equal to sales requirements for the next two month's budgeted sales.

(*f*) Trade creditors are paid in the following month after purchases.

(*g*) Fixed costs are ₹ 5,000 per month, including ₹ 2,000 depreciation.

You are required to prepare a cash budget for each of the first three months of coming year.

[*Answer:* Purchases for different months are ₹ 33,000, ₹ 36,000, and ₹ 30,000. The closing cash balance on March 31 is ₹ 45,600.]

CHAPTER

15

Receivables Management

"Accounts receivable are simply extensions of credit to the firm's customers, allowing them a reasonable period of time in which to pay for the goods. Most firms treat account receivable as a marketing tool to promote sales and profits. The financial officer must analyze how much the firm should invest in account receivable, for there is always a temptation to extend too much credit in an effort to boost sales beyond the point where the return on the investment in account receivable is no longer as attractive as the return on other investment opportunities. It is the financial officer's responsibility to guard against over investment in account receivable."[1]

SYNOPSIS

- Introduction.
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- Graded Illustrations in Receivables Management.

1. Bolten S.E., *Managerial Finance,* Houghton Mifflen Company Bosten, 1976, p. 445.

Receivables are almost certain and inevitable to arise in the ordinary course of business. They represent extension of credit and must be carefully managed. Every firm must develop a credit policy that includes setting credit standard, defining credit terms and employing methods for timely collection of receivables. The receivables (including the debtors and the bills) constitute a significant portion of the working capital and is an important element of it. The receivables emerge whenever goods are sold on credit and payments are deferred by customers. Receivables are created when a firm sells goods or services to its customers and accepts, instead of the immediate cash payment, the promise to pay within specified period. Thus, receivables is a type of loan extended by the seller to the buyer to facilitate the purchase process. As against the ordinary type of loan, the trade credit in the form of receivables is not a profit making service but an inducement or facility to the buyer-customer of the firm.

The receivable is an assets as it represents a claim of the firm against its customers, expected to be realized in near future. Since credit sales assumes a sizable proportion of total sales in any firm, the receivable management becomes an area of attention. Every firm has a set of credit terms and policies under which goods are sold on credit, and every policy has a cost and benefit associated with it. This Chapter attempts as to how to balance the cost and benefit of a credit policy and the measures which may be taken in this reference.

The receivables represent credit allowed to customer and thereby allowing them to delay the payment. In a competitive environment, sometimes the firms are compelled and sometimes the firms desire to adopt liberal credit policies for pushing up the sales. Higher credit sales at more liberal terms will no doubt increase the profit of the firm, but simultaneously also increases the risk of bad debts as well as result in more and more funds blocking in the receivables. So, a careful analysis of various aspects of the credit policy is required. This is what is known as Receivables Management (RM). The term RM may be defined as collection of steps and procedure required to properly weigh the costs and benefits attached with the credit policies. The RM consists of matching the cost of increasing sales (particularly credit sales) with the benefits arising out of increased sales with the objective of maximizing the return on investment of the firm. There are various costs and benefits attached with a credit policy. These may be enumerated as follows :

COSTS OF RECEIVABLES

1. Cost of Financing : The credit sales delays the time of sales realization and therefore the time gap between incurring the cost and the sales realization is extended. This results in blocking of funds for a longer period. The firm on the other hand, has to arrange funds to meet its own obligation towards payment to the supplier, employees, etc. These funds are to be procured at some explicit or implicit cost. This is known as the cost of financing the receivables.

2. Administrative Cost : A firm will also be required to incur various costs in order to maintain the record of credit customers both before the credit sales as well as after the credit sales. Before credit sales, costs are incurred on obtaining information regarding credit worthiness of the customers; while after credit sales, the cost are incurred on maintaining the record of credit sales and collection thereof.

3. Delinquency Costs : Over and above the normal administrative cost of maintaining and collection of receivables, the firm may have to incur additional costs known as delinquency costs, if there is delay in payment by a customer. The firm may have to incur cost on reminders, phone calls, postage, legal notices, etc. Moreover, there is always an opportunity cost of the funds tied up in the receivables due to delay in payment.

4. Cost of Default by Customers : If there is a default by a customer and the receivable becomes, partly or wholly, unrealizable, then this amount, known as bad debt, also becomes a cost to the firms. This cost does not appear in case of cash sales.

Different cost associated with the receivables have been presented in Figure 15.1. The Figure 15.1 shows that the total cost of receivables consists of cost of financing, which is a factor of time, *plus* cost of administration *plus* cost of delinquency *plus* cost of default. However, the receivables does not result in increasing the cost only, rather they bring some benefits also to the firm.

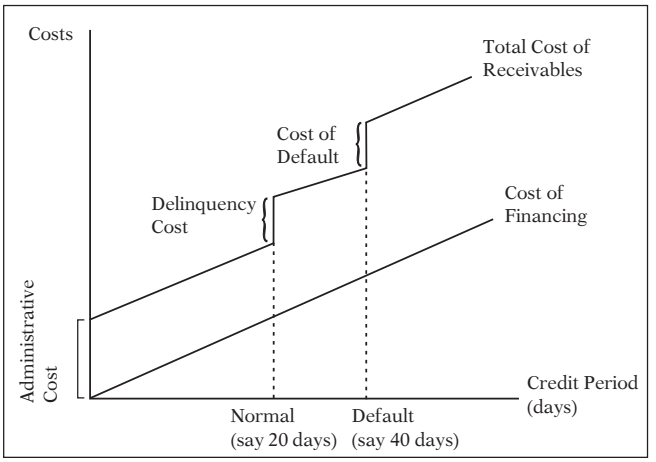

FIGURE 15.1: DIFFERENT TYPES OF COSTS OF RECEIVABLES.

BENEFITS OF RECEIVABLES

(a) Increase in Sales : Except a few monopolistic firms, most of the firms are required to sell goods on credit, either because of trade customs or other conditions. The sales can further be increased by liberalizing the credit terms. This will attract more customers to the firm resulting in higher sales and growth of the firm.

(b) Increase in Profits : Increase in sales will help the firm (*i*) to easily recover the fixed expenses and attaining the break-even level, and (*ii*) increase the operating profit of the firm. In a normal situation, there is a positive relation between the sales volume and the profit.

(c) Extra Profit : Sometimes, the firms make the credit sales at a price which is higher than the usual cash selling price. This brings an opportunity to the firm to make extra profit over and above the normal profit.

Thus, the receivables bring some costs as well as benefits to the firm. Both the cost and the benefits are to be looked carefully and a trade-off between them should be attempted.

Trade-off on Receivables : Firms offer credit to customers for a number of reasons, but the ultimate objective is to generates sales that would not have occurred otherwise; either because the customers do not have the cash to pay for the product or because credit increases the likelihood of higher sales. The costs associated with offering credit are two fold : In the first place, as already said above, granting credit exposes the firm to the possibility that the customer will default, resulting in the losses to the firm (in the form of bad debts and the collection costs). The firm also has another cost in the form of interest foregone between the time of sales and the time of sales realization. This cost can however be partially or fully off set by charging customers interest cost for buying goods on credit. In fact, in cases where the firm can charge higher interest rate from the customer, such interest income becomes a profit instead of a cost to the firm.

The trade-off on receivables can be applied to find out whether to liberalize the credit terms or not. More liberal credit terms may be expected to generate higher sales revenue and higher profits; but they increase the potential costs also. If the net benefit expected from liberalizing the credit terms is positive, the firm may offer such terms, otherwise not.

When a firm adopts more liberal credit policies, the sales increases resulting in higher profits. However, as already pointed out, the chances of bad debts will also increase and there will be a decrease in liquidity of the firm. On the other hand, a stringent credit policy reduces the profitability but may increase the liquidity of the firm. The opposite forces of profitability and liquidity have been presented in Figure 15.2.

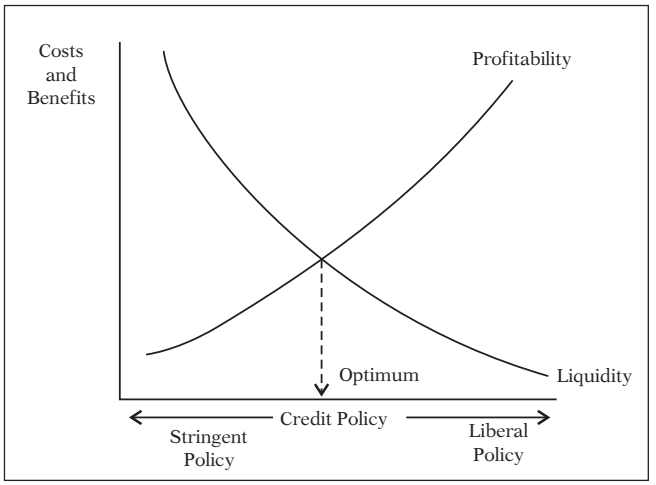

FIGURE 15.2 : CREDIT POLICY, PROFITABILITY AND LIQUIDITY OF A FIRM.

The Figure 15.2 shows that as the firm takes its credit policy towards making more and more liberal, its liquidity decreases whereas the profitability increases. On the other hand, if the firm makes its credit policy more and more stringent, the liquidity may increase but the profitability will definitely go down. Thus, a firm should try to frame its credit policy in such a way as to attain the best possible combination of profitability and liquidity.

In any firm, the quantum of receivables is determined by several factors. First, the percentage of credit sales to total sales affects the amount of receivables. This factor is an important determinant, yet it is not within the control of the financial manager. The nature of the business and the conventions prevailing in the trade determine the blend between the cash sales and credit sales. The level of sales is also a factor in determining the level of receivables. Obviously, higher the sales, greater would be the receivable. Another determinant of the level of receivables is the credit and collection policies, *i.e.*, the terms of the sales. The quality of the customers and the collection efforts; and these policies are however, under the control of the financial manager.

The terms of sales specify both the time period during which the customer must pay as well as discount and penalties. The type or quality of the customers also affects the investments in receivables. For example, acceptance of poorer credit customers and their subsequent delayed payments may lead to an increase in the receivables. The strength and the timing of the collection efforts can affect the period for which the receivables remain delinquent which in turn affect the quantum of receivables. So, the receivables management must be attempted by adopting a systematic approach and considering the following aspects of receivables management:

1. The credit policy.
2. The credit evaluation.
3. The credit control.

CREDIT POLICY

A firm makes significant investment by extending credit to its customers and thus requires a suitable and effective credit policy to control the level of total investment in the receivables. The basic decision to be made regarding receivables is to decide how much credit be extended to a customer and on what terms. This is what is known as the credit policy. The credit policy may be defined as the set of parameters and principles that govern the extension of credit to the customers. This requires the determination of (*i*) the credit standard *i.e.*, the conditions that the customer must meet before being granted credit, and (*ii*) the credit terms *i.e.*, the terms and conditions on which the credit is extended to the customers. These are discussed as follows :

(i) The Credit Standards : When a firm sells on credit, it takes a risk about the paying capacity of the customers. Therefore, to be on a safer side, it must set credit standard which should be applied in selecting customers for credit sales. The initial tendency may be to set rigorous stan-

dards which may hamper the sales growth. At the other extreme, if the standards are set loosely, it may make the firm to bear losses as many customers may turn out to be bad debts. Therefore, the problem is to balance the benefits of additional sales against the cost of increasing bad debts. The following points are worth noting while setting the credit standard for a firm :

- Effect of a particular standard on the sales volume.
- Effect of a particular standard on the total bad debts of the firm, and
- Effects of a particular standard on the total collection cost.

(ii) Credit Terms : The credit terms refer to the set of stipulations under which the credit is extended to the customers. While the custom of the market frequently dictate the nature of the credit terms and conditions offered by a firm, the firm, nevertheless, can design its own credit terms as a dynamic instruments in its overall sales efforts. The credit terms specify how the credit will be offered, including the length of the period for which the credit will be offered, the interest rate on the credit, and the cost of default. The credit terms may relate to the following :

Credit Period : The credit period is an important aspect of the credit policy. It refers to the length of time over which the customers are allowed to delay the payment. There is no hard and fast rule regarding the credit period and it may differ from one market to another. The credit period generally varies from 3 days to 60 days. In some cases, the credit period may be zero and only cash sale are made. Customary practices are important factor in deciding the credit period. The firm however, must be aware of the cost of granting credit to the customers for different periods.

Lengthening the credit period increases the sales by attracting more and more customers, whereas the squeezing the credit period has the distracting effect. The effect of changing the credit period is similar to that of changing the credit standard and hence requires careful analysis. The firm must consider the cost involved in increasing the credit period which will result in increase in the investment in receivables.

Discount Terms : The customers are generally offered cash discount to induce them to make prompt payments. Different discount rates may be offered for different periods *e.g.*, 3% discount if payment made within 10 days; 2% discount if payment made within 20 days etc. Both the discount rate and the period within which it is available are reflected in the credit terms *e.g.*, 3/10, 2/20, net 30 means that 3% cash discount if payment made within 10 days; 2% discount if payment made within 20 days; otherwise full payment by the end of 30 days from the date of sale. When a firm offers a cash discount, its intention is to accelerate the flow of cash into the firm to improve its cash position. The length of cash discount affects the collection period. Some customers, who were not paying promptly, may be tempted to avail the discount and may pay earlier. This will result in shortening of the average collection period.

Annual Percentage Cost of Cash Discount : There is always a cost of cash discount. If a firm has an average collection period of 40 days, and in order to reduce the average collection period, it offers a cash discount of 3% if payment is made in 10 days. A customer having a balance of ₹ 100, who was paying in 40 days, now avails the discount of 3% and pays ₹ 97 on the 10th day. So, the firm will be having ₹ 97 for a period of 30 days (*i.e.*, 40–10), and the cost is ₹ 3. The annual cost of this discount may be calculated as follows :

$$\text{Annual financing cost} = \frac{₹\ 3}{₹\ 97} \times \frac{365}{30} \times 100 = 37.6\%$$

So, the annual cost of offering cash discount is 37.6%. This is also known as Annualised Cost of Cash Discount. This may be compared with the cost of financing from other sources to decide whether to offer discount to customers or not. The annual financing cost may be ascertained as follows :

$$\text{Annual financing cost} = \frac{\%\ \text{Discount}}{100 - \%\ \text{Discount}} \times \frac{365}{\text{Credit Period} - \text{Discount Period}} \times 100$$

The first part of this formula *i.e.*, % Discount ÷ (100–% Discount rate) expresses the cost of providing cash discount to the customers for the period involved. In the above case, the period involved is 30 days. So, the firm is incurring a cost of ₹ 3/₹ 97 *i.e.*, 3.092% for a period of 30 days. At an annual rate, this amounts to 3.092% × (30/365) *i.e.*, 37.6% per annum.

Liberalizing the discount rate means increasing the discount rate for the same payment period or maintaining the same discount rate for a longer payment period. Increase in discount rate will tantamount to reducing the ultimate selling price resulting in increase in sales. Increasing the collection period results in increasing the amount of receivables and hence the higher cost of receivables. Therefore, any change in discount terms should be evaluated in terms of costs and benefits of such change.

CREDIT EVALUATION

The receivables are generally considered a relatively low risk asset. The basic risk is due to the possibility that the firm will not be able to collect all that is due to it by the customers. Under normal circumstances, the total bad debts losses a firm will experience can be forecast with reasonable accuracy, especially if the firm sells to large number of customers and does not change its credit policies. These normal losses can be considered purely a cost of extending credit. The real risk arises from the possibility that a significant number of customer may suddenly become bad debts. So, at the time of extending credit to the customers, the firm must know the creditworthiness of the customer *i.e.*, whether a particular customer be extended any credit or not, and if yes, how much and on what conditions.

Credit evaluation involves determination of the type of customers who are going to qualify for the trade credit. Several costs are associated with extending credit to less creditworthy customers. As the probability of default increases, it becomes more important to identify which of the possible new customers would be risky. When more time is spent investigating the less creditworthy customers, the cost of credit investigation increases. Default costs also vary directly with the quality of the customers. As the customer's credit rating declines, the chance that the amount will not be paid on time increases. Collection costs also increase as the quality of the customers declines. More delinquent customers force the firm to spend more time and money collecting them. In nutshell, the decline in customers quality results in increased cost of default, collection and credit investigation.

Assessment of the creditworthiness of a customer is subjective matter and a lot depends upon the experience and judgment of the person taking the decision. There are three basic factors of creditworthiness of a customer. First, the character *i.e.*, the willingness and the practice of the customer to honour his obligations by paying as agreed. Second, the capacity *i.e.*, the financial ability of the customer to pay as agreed, and third, the collateral *i.e.*, the security offered by the customer against the credit. Evaluation of creditworthiness of a customer is a two steps procedure (*i*) collection of information, and (*ii*) analysis of information.

Collection of Information : In order to make better decisions, the firm may collect information from various sources on the prospective credit customers. The following are sources of information which can provide sufficient data or information about the creditworthiness of a customer :

(*a*) ***Bank Reference :*** Though the banks may be reluctant to give financial information of its customers, yet may be asked to comment on the financial position of a particular customer. The customer may also be required to ask his bank to provide necessary information in this respect.

(*b*) ***Credit Agency Report :*** There are certain credit rating agencies which provide independent information on the creditworthiness of different parties. These agencies gather information on the credit history of different businessmen and sell it to the firms which want to extend credit. Obviously, people who have failed to pay their bills in the past are viewed as greater credit risk than those who have an un-blemished credit record. From these agencies, a special report in respect of a particular customer may also be obtained. In India, however, the credit agency system is not popular and there is a need to develop such a network which can provide reliable information.

(*c*) ***Published Information :*** The published financial statements of the customers for few preceding years may also be taken as a source of information, as they contain a lot of details regarding the operations. Various ratios calculated on the basis of these financial statements may throw light on the profitability, liquidity, and debt service capacity of a customer.

(*d*) ***Credit Scoring :*** If the credit request is large enough, then the firm can send its own representatives/employees to collect information about the customer. In this case, the customer may be evaluated through the use of credit scoring which involves the numerical evaluation of each of the new customers who receive a score based on his answers to a simple set of questions. This score is then evaluated according to a pre-determined standard, its level relative to the standard determining whether credit should be extended. The major benefit of credit scoring is that it is relatively inexpensive and less time consuming.

Information collection is often costly and therefore, the firms also weigh the benefits of gathering information against its costs. It should, in particular, gather only as much information as is required and necessary to find out the credit worthiness of the customer with a reasonable degree of accuracy.

Analysis of Information : Collection of information in respect of any customer is not going to serve any purpose in itself. Once all the available credit information about a potential customer has been gathered, it must be analyzed to reach at some conclusion regarding the creditworthiness of a customer. The five well known C's of credit : Character, Capacity, Capital, Collateral and Conditions provide a frame work for the evaluation of a customer. These characteristics can throw light on the creditworthiness or default-risk of the customer. Step by step analysis of information may be made and assessment should be made at various point to ascertain whether further analysis is required or not.

CONTROL OF RECEIVABLES

Once the credit has been extended to a customer as per the credit policy, the next important step in the management of receivables is the control of these receivables. Merely setting of standards and framing a credit policy is not sufficient; equally important is their effective implementation to control the receivables. In this reference, the efforts may be required in two directions as follows :

1. The Collection Procedure : Once a firm decides to extend credit and defines the terms of credit sales, it must develop a policy for dealing with delinquent or slow paying customers. There is a cost of both : Delinquent customers create bad debts and other costs associated with repossession of goods, whereas the slow paying customers cause more cash being tied up in receivables and the increased interest cost. The firm should have a built in system under which the customer may be reminded a few days in advance about the bill becoming due. After the expiry of due date of the payment, the firm should make statements, reminders, telephone calls and even personal visits to the paying customer. Ultimately legal action for recovery of due amount may also be resorted to, though it can be very costly and time consuming. No doubt, that legal actions may have little effect on the ability of the customer to pay, but it can definitely speed up the legal relief.

The overall collection procedure of the firm should neither be too lenient (resulting in mounting receivables) nor too strict (resulting sometimes even loss of customers). A strict collection policy can affect the goodwill and damage the growth prospects of the sales. If a firm has a lenient credit policy, the

customer with a natural tendency towards slow payments, may become even slower to settle his accounts. Overly aggressive collection policy may offend good customers who inadvertently have failed to pay in time. One possible way of ensuring early payments from customers may be to charge interest on over due balances. But this penal interest and the rate thereof must be agreed in advance and better written in the sale document. Thus, the objective of collection procedure and policies should be to speed up the slow paying customer and reduce the incidence of bad debts.

2. Monitoring of Receivables : In order to control the level of receivables, the firm should apply regular checks and there should be a continuous monitoring system. The financial managers should keep a watch on the creditworthiness of all the individual customers as well as on the total credit policy of the firm. For this, number of measures are available as follows :

(*i*) A common method to monitor the receivables is the collection period or number of day's outstanding receivables. The average collection period may be found by dividing the average receivables by the amount of credit sales per day *i.e.*,

$$\text{Average Collection Period} = \frac{\text{Average Receivables}}{\text{Credit Sales per day}}$$

Number of days sales outstanding may be calculated, say, on a weekly basis. For example, every Saturday the firm may divide the total outstanding receivables with the average daily credit sales. The quotient gives an idea as to how many day's credit sales are uncollected. Such quotient, if ascertained for a number of weeks, may give an idea about the trend of total receivables.

(*ii*) Another technique available for monitoring the receivables is known as ***ageing schedule***. The quality of the receivables of a firm can be measured by looking at the age of receivables. The older the receivable, the lower is the quality and greater the likelihood of a default. In the ageing schedule, the total outstanding receivables on a particular days (at the end of a month or a year) are classified into different age groups (age being the number of days since becoming outstanding) together with percentage of total receivables that fall in each age group. For example, the receivables of a firm, having a normal credit period of 30 days, may be classified as follows :

Age Group (Number of Days)	% of Total Outstanding Receivables
Less than 30 days	60%
31—45 days	20%
46—60 days	10%
61 and above	10%

It may be noted that, the firm has a credit period of 30 days and 60% of the total receivables are less than 30 days old. 20% of the receivables are over due by 15 days, 10% are over due by 30 days and 10% are over due by more than 30 days. This type of ageing schedule can provide a kind of an early warning suggesting (*i*) deterioration of receivables quality, and (*ii*) where to emphasize the appropriate corrective actions. When compared with the past ageing schedule done by the same firm or done by other comparable firms, this may provide an indication of whether the firm should start worrying about its collection procedure. By comparing the ageing schedules for different periods, the financial manager can get an idea of any required change in the collection procedure and can also point out those customers which require special attention. However, a basic shortcoming of the ageing schedule is that it is influenced by the change in sales volume.

3. Lines of Credit : Another control measure for receivables management is the line of credit which refers to the maximum amount a particular customer may have as due to the firm at any time. Different lines of credit may be allowed to different customers. As long as the customer's unpaid balance remain within this maximum limit, the account may be routinely handled. However, if a new order is going to increase the indebtedness of a customer beyond his line of credit, then the case must be taken for an approval for a temporary increase in the line of credit.

The lines of credit must be reviewed periodically for all the customers. This review of credit lines, however, need not necessarily mean that credit lines must be changed. Rather, the credit line may remain unchanged or may be increased or reduced. In an extreme case, the credit lines after a review may even be suspended if the experience with a particular customer is not satisfactory. Sometimes, the customer may himself request for a review of credit line in order to obtain more credit or more liberal credit terms. Such a request should be looked into properly and costs and benefits of extending credit terms should be evaluated.

4. Accounting Ratios : Accounting information may be of good help in order to control the receivables. Though, several ratios may be calculated in this regard, two accounting ratios, in particular may be calculated to find out the changing pattern of receivables. These are (*i*) Receivables Turnover Ratio, and (*ii*) Average Collection Period. The procedure for the calculation of these ratios has been discussed in detail in Chapter 3.

Both the ratios should be calculated on a continuous basis to monitor the receivables. The ratios so calculated for the firms must then be compared with the standard for that industry or with the past ratios of the same firm. For example, if the receivables turnover for the firm is 6 against the industry average of 8, then there is something to worry about. Similarly, if the average collection period is 40 days against the established credit period of 30 days only, then this is clearly an indication of deterioration in the collection procedure and the credit evaluation process. Both the accounting ratios may indicate a need for an immediate attention towards the entire credit policy.

EVALUATION OF CREDIT POLICIES

A firm may face a situation when it has several alternative credit policies before it and has to select one such policy

which is the most profitable to the firm. For example, the firm may extend the credit of 15 days, 30 days, 40 days, 60 days, *etc.* to its customers. Every credit policy will result in a particulars sales level. Normally, longer the credit period, higher will be the sales, and therefore, larger would be the profit of the firm. Does it mean that the firm should go on increasing the credit period ? Definitely, No.

There is no doubt that increase in sales will increase the contribution (Sales–Variable Cost). But simultaneously, the firm will face the risk of increase in other costs also. There costs may be :

(a) Increase in investment in debtors : Increase in credit period will naturally result in higher and higher amount of outstanding debtors, which results in more funds of the firm blocked in debtors. There is always a cost of funds to the funds. So, the higher average debtors result in higher cost to the firm.

(b) Increase in bad debts : Longer credit period facility will attract more and more customers. Some of these customers may turn out to be defaulter, and the firm will have to bear the cost of bad debts. As the sales increases (as a result of longer credit period), the chances of bad debts also increase.

(c) Other costs : Increase in debtors may also require the firm to incur some other expenses.

So, on the one hand, the firm has benefits (in the form of higher profits) from the increase in credit period, while on the other hand, the firm has to bear some additional costs. At the time of evaluation of different proposals of credit policies, what is required is to compare (trade off) the costs and, benefits associated with each credit policy. The firm should select that proposal which is expected to give highest net profit (benefits - costs). This comparison of costs and benefits may be attempted as follows :

(*i*) Total profit under different proposals, or

(*ii*) Incremental profit under different proposals.

Graded Illustrations given below explain the procedure under both the approaches.

POINTS TO REMEMBER

- The receivables emerge when goods are sold on credit and the payments are deferred by the customers. So, every firm should have a well defined credit policy.
- The receivables management refers to managing the receivables in the light of costs and benefits associated with a particular credit policy.
- The different costs attached with receivables are the administrative costs, financing costs, delinquency costs and the cost of defaults. The benefits of receivables are available in terms of increase in sales, and profits.
- The receivables management includes (*i*) the framing of Credit policy, (*ii*) Credit evaluation of customers and (*iii*) Credit control.
- The credit policy deals with the setting of credit standards and credit terms relating to cash discount and credit period.
- Cash discount offered to customers, for inviting them to make prompt payment, should be translated into 'Annualised cost of cash discount' for comparison purposes.
- The credit evaluation includes the steps required for collection and analysis of information regarding the creditworthiness of the customer.
- The control and monitoring of receivables aims at timely collection of receivables and keeping a vigil over the balance.
- Several techniques such as average collection period, ageing schedule *etc.* may be used for this purpose.
- Credit period offered to customers should be critically evaluated in terms of cost benefit trade off.

GRADED ILLUSTRATIONS

Illustration 15.1

A company has prepared the following projections for a year :

Sales	21,000 units
Selling Price per unit	₹ 40
Variable Costs per unit	₹ 25
Total Costs per unit	₹ 35
Credit period allowed	One month

The company proposes to increase the credit period allowed to its customers from one month to two months. It is envisaged that the change in the policy as above will increase the sales by 8%. The company desires a return of 25% on its investment. You are required to examine and advise whether the proposed Credit Policy should be implemented or not.

Solution :

EVALUATION OF CREDIT POLICY

	Present	Proposed	Incremental
Sales (units)	21,000	22,680	1,680
Contribution per unit	₹ 15	₹ 15	₹ 15
Total contribution	₹ 3,15,000	₹ 3,40,200	₹ 25,200
Variable cost @ ₹ 25	5,25,000	5,67,000	42,000
Fixed cost	2,10,000	2,10,000	—
Total cost	7,35,000	7,77,000	42,000
Credit Period	1 month	2 months	—
Average Debtors at Cost	₹ 61,250	₹ 1,29,500	₹ 68,250

$$\text{Incremental Return} = \frac{\text{Increased Contribution}}{\text{Extra funds blockage}} \times 100$$

$$= \frac{₹\ 25,200}{₹\ 68,250} \times 100 = 36.92\%$$

The return due to change in the credit policy comes to 36.92%, which is more than the desired return of 25%. Hence, the proposal of increasing the credit period from one month to two months may be accepted.

Illustration 15.2

A company believes that it is possible to increase sales if credit terms are relaxed. The profit plan, based on the old credit terms, envisages projected sales at ₹ 10,00,000, a 30 per cent profit-volume ratio, fixed cost at ₹ 50,000, bad debts of 1.00 per cent and an accounts receivable turnover ratio of 10 times.

The relaxed credit policy is expected to increase sales to ₹ 12,00,000. However, bad debts will rise to 2 per cent of sales, the accounts receivable turnover ratio will be decreased to 6 times. Should the company adopt new (relaxed) credit policy, assuming the company's target rate of return is 20 per cent.

Solution :

The two credit policies can be compared as follows :

	Existing Terms	Proposed Terms
Sales	₹ 10,00,000	₹ 12,00,000
Contribution @ 30%	3,00,000	3,60,000
Less: Fixed Cost	50,000	50,000
Net Income (A)	2,50,000	3,10,000
Total Debtors at Cost	7,50,000	8,90,000
Credit Period Turnover	10 times	6 times
Average Debtors	₹ 75,000	₹ 1,48,333
Average cost @ 20%	15,000	29,667
Bad Debt @ 1%/2%	10,000	24,000
Total Cost (B)	25,000	53,667
Net Benefit (A – B)	2,25,000	2,56,333

As the benefits is higher in proposed case, it is better and may be adopted.

Illustration 15.3

ABC & Company is making sales of ₹ 16,00,000 and it extends a credit of 90 days to it's customers. However, in order to overcome the financial difficulties, it is considering to change the credit policy. The proposed terms of credit and expected sales are given hereunder :—

Policy	Terms	Sales
I	75 days	₹ 15,00,000
II	60 days	₹ 14,50,000
III	45 days	₹ 14,25,000
IV	30 days	₹ 13,50,000
V	15 days	₹ 13,00,000

The firm has a variable cost of 80% and a fixed cost of ₹ 1,00,000. The cost of capital is 15%. Evaluate different proposed policies and which policy should be adopted? (Year may be taken as 360 days).

Solution :

In this case, different policies have different sales level and therefore different profit level. As the credit period is reduced, the sales also decreases and the profit of the firm will also go down. However, on the other hand, the reduction in credit term will also result in decrease in average receivables. This decrease in average receivable will result in lesser funds blocked in receivables and this will reduces the cost of maintaining debtors. Different credit policies may be evaluated as follows :

(Figures in ₹)

	Present	I	II	III	IV	V
Sales	16,00,000	15,00,000	14,50,000	14,25,000	13,50,000	13,00,000
–Variables Cost @ 80%	12,80,000	12,00,000	11,60,000	11,40,000	10,80,000	10,40,000
–Fixed Cost	1,00,000	1,00,000	1,00,000	1,00,000	1,00,000	1,00,000
Profit (A)	2,20,000	2,00,000	1,90,000	1,85,000	1,70,000	1,60,000
Total Cost	13,80,000	13,00,000	12,60,000	12,40,000	11,80,000	11,40,000
Average Receivable (at cost) (Cost ÷ 360) × Credit Period	3,45,000	2,70,833	2,10,000	1,55,000	98,333	47,500
Cost of debtors @ 15% (B)	51,750	40,625	31,500	23,250	14,750	7,125
Net Profit (A–B)	1,68,250	1,59,375	1,58,500	1,61,750	1,55,250	1,52,875

It may be observed that the profit of the firm is going to reduce from the present level of ₹ 1,68,250. However, the decrease is least in case of Policy III (Credit period 45 days). So, the firm may opt the proposed Policy III.

Illustration 15.4

(*b*) The management of Akruti Ltd. is considering to change its present credit policy. The details of the options are given below :

Sales (in ₹ '000)

Credit Policy	Present	A	B	C
Sale	50	56	60	62
VC (80% of sale)	40	44.8	48	49.6
Fixed cost	6	6	6	6
Average collection period	30	45	60	75

Firm's rate of investment is 20%. Assuming 360 days in a year advise which of the options is best.

[B.Com. (H.) D.U., 2011]

Solution :

Evaluation of Credit Policies:

(Figures in ₹)

Credit period	Present 30 days	Policy A 45 days	Policy B 60 days	Policy C 75 days
Sales (A)	50,000	56,000	60,000	62,000
– Variable Cost	40,000	44,800	48,000	49,600
– Fixed Cost	6,000	6,000	6,000	6,000
Total Cost (B)	46,000	50,800	54,000	55,600
Av. Debtors or at Cost	3,833	6,350	9,000	11,583
Interest @20% (C)	767	1,270	1,800	2,317
Surplus (A – B – C)	3,233	3,930	4,200	4,083
Incremental surplus	—	697	967	850

As the surplus is maximum in Policy B, it should be adopted.

Illustration 15.5

XYZ & Company is making a sales of ₹ 50,00,000 by extending a credit to its customers resulting in average debtors of ₹4,29,604. It has a variable cost of 70%. It is believed that sales can be increased by liberalising the credit terms from present position upto 90 days. The sales manager has given following estimates of sales under different credit period.

Policy	Terms	Sales
I	45 days	₹ 56,00,000
II	60 days	₹ 60,00,000
III	75 days	₹ 65,00,000
IV	90 days	₹ 72,00,000

Which policy is best for the firm given that the cost of capital of the firm is 20% (Year = 360 days)

Solution :

In this case, the best credit policy may be selected on the basis of net profit under different policies on the basis of incremental profit. In the incremental profit analysis, each of the proposed policy is evaluated *viz a viz* the present policy, and whichever policy gives the maximum additional profit is adopted. It may be noted that in the incremental profit analysis, the existing fixed cost (which is already covered by the existing sales level) is irrelevant and hence ignored. However, if the fixed cost is expected to change, then such change should be incorporated to find out the incremental profit. The evaluation of different proposals may be made as follows :

(Figures in ₹)

	Present	I	II	III	IV
Sales	50,00,000	56,00,000	60,00,000	65,00,000	72,00,000
Increase in Sales	—	6,00,000	10,00,000	15,00,000	22,00,000
Increase Variable Cost @ 70%	—	4,20,000	7,00,000	10,50,000	15,40,000
Increase in Contribution (A)	—	1,80,000	3,00,000	4,50,000	6,60,000
Credit Period	—	45 days	60 days	75 days	90 days
Average debtors (Sales ÷ 360) × Credit Period	4,29,604	7,00,000	10,00,000	13,54,167	18,00,000
Increase in debtors	—	2,70,396	5,70,396	9,24,563	13,70,396
Increase in debtors (at cost 70%)	—	1,89,277	3,99,277	6,47,194	9,59,277
Cost of investment in Debtors @ 20% (B)	—	37,856	79,856	1,29,439	1,91,856
Incremental Profit (A – B)	—	1,42,144	2,20,144	3,20,561	4,68,144

So, the firm may adopt credit policy IV (Credit period 90 days), and the profit of the firm will increase by ₹ 4,68,144.

Illustration 15.6

A trader whose current sales are ₹ 15 lakhs per annum and average collection period is 30 days wants to pursue a more liberal credit policy to improve sales. A study made by a consultant firm reveals the following information :

Credit Policy	Increase in Collection Period	Increase in Sales
A	15 days	₹ 60,000
B	30 days	90,000
C	45 days	1,50,000
D	60 days	1,80,000
E	90 days	2,00,000

The selling price per unit is ₹ 5. Average cost per unit is ₹ 4 and variable cost per unit is ₹ 2.75 paise per unit. The required rate of return on additional investments is 20 per cent. Assume 360 days a year and also assume that there are no bad debts. Which of the above policies would you recommend for adoption ? *[B.Com.(H.), D.U., 2012]*

Solution : **Evaluation of Different Credit Policies**

Particulars	Present	A	B	C	D	E
Credit period	30 days	45 days	60 days	75 days	90 days	120 days
No. of units @ ₹ 5	3,00,000	3,12,000	3,18,000	3,30,000	3,36,000	3,40,000
Sales	₹ 15,00,000	₹ 15,60,000	₹ 15,90,000	₹ 16,50,000	₹ 16,80,000	₹ 17,00,000
Variable Cost @ ₹ 2.75	8,25,000	8,58,000	8,74,500	9,07,500	9,24,000	9,35,000
Fixed Cost	3,75,000	3,75,000	3,75,000	3,75,000	3,75,000	3,75,000
Total Cost	12,00,000	12,33,000	12,49,500	12,82,500	12,99,000	13,10,000
Profit (A)	3,00,000	3,27,000	3,40,500	3,67,500	3,81,000	3,90,000
Average Debtors (at Cost)						
(Cost ÷ 360) × Credit Period	1,00,000	1,54,125	2,08,250	2,67,188	3,24,750	4,36,667
Cost of investment @ 20% (B)	20,000	30,825	41,650	53,437	64,950	87,333
Net profit (A–B)	2,80,000	2,96,175	2,98,850	3,14,063	3,16,050	3,02,667

The credit policy D (credit period 90 days) is expected to increase the profit to ₹ 3,16,050 and therefore may be adopted.

Illustration 15.7

A company is currently engaged in the business of manufacturing computer component. The computer component is currently sold for ₹ 1,000 and its variable cost is ₹ 800. For the year ended, the company sold on an average 500 components per month.

Presently company grants one month credit to its customers. The company is thinking of extending the credit to two months on account of which the following is expected:

Increase in Sales	:	25 per cent
Increase in Stock	:	₹ 2,00,000
Increase in Creditors	:	₹ 1,00,000

You are required to advise the company whether or not to extend the credit terms.

If all customers avail the credit period of two months. Company expects a minimum return of 40% on investment.

[B.Com. (H.), D.U., 2010]

Solution :

Evaluation of Credit Policies :

	Existing	Proposed
Monthly Sales (Units)	500	625
Selling Price (₹)	1000	1000
Variable Cost (₹)	800	800
Monthly Variable Cost (₹)	4,00,000	5,00,000
Credit Period	1 month	2 months
Average Debtors at Cost (₹)	4,00,000	10,00,000
+ Increase in Stock (₹)	—	2,00,000
– Increase in Creditors (₹)	—	1,00,000

	Existing	Proposed
Net Investment	4,00,000	1,10,000
Financing Cost @ 40%	1,60,000	4,40,000
Increase in Fixed Cost	—	2,80,000
Increase in Profit (125 × 200)	—	25,000
Incremental Loss	—	2,55,000

The proposed policy is expected to result in loss. So, the firm should continue with existing policy.

Illustration 15.8

Super Sports Co., dealing in sports goods, have an annual sale of ₹ 50,00,000 and are currently extending 30 day's credit to the dealers. It is felt that sales can pick up considerably if the dealers are willing to carry increased stock, but the dealers have difficulty in financing their inventory. Super Sports Co. is, therefore, considering a shift in credit policy. The following information is available:

The average collection period now is 30 days.

Costs : Variable cost 80% of sales.

Fixed cost ₹ 6 lac per annum.

Required (before tax) return an investment = 20%

Credit Policy	Average Collection Period	Annual Sales (₹ in lacs)
A	45 days	56
B	60 days	60
C	75 days	62
D	90 days	63

Determine which policy should be adopted by the company on the basis of (1) Total Profit, and (2) Incremental Profit.

Solution: **EVALUATION OF CREDIT POLICIES (TOTAL PROFIT)** **(Figure in ₹)**

	Present	I	II	III	IV
Sales	50,00,000	56,00,000	60,00,000	62,00,000	63,00,000
Less Variables cost @ 80%	40,00,000	44,80,000	48,00,000	49,60,000	50,40,000
Less Fixed cost	6,00,000	6,00,000	6,00,000	6,00,000	6,00,000
Total cost	46,00,000	50,80,000	54,00,000	55,60,000	56,40,000
Profit (A)	4,00,000	5,20,000	6,00,000	6,40,000	6,60,000
Credit Period	30 days	45 days	60 days	75 days	90 days
Average Debtors at cost					
(Cost ÷ 360) × Credit Period	3,83,333	6,35,000	9,00,000	11,58,333	14,10,000
Cost of investment in Debtors @ 20% (B)	76,667	1,27,000	1,80,000	2,31,667	2,82,000
Net Profit (A-B)	3,23,333	3,93,000	4,20,000	4,08,333	3,78,000

The firm may adopt the credit policy II (credit period 60 days) as it is expected to result in profit of ₹ 4,20,000 which is highest among all the proposed policies.

EVALUATION OF CREDIT POLICIES (INCREMENTAL PROFIT) **(Figure in ₹)**

	Present	I	II	III	IV
Sales	50,00,000	56,00,000	60,00,000	62,00,000	63,00,000
Incremental Sales	—	6,00,000	10,00,000	12,00,000	13,00,000
– Incremental Variable cost @ 80%	—	4,80,000	8,00,000	9,60,000	10,40,000
Incremental Profit (A)	—	1,20,000	2,00,000	2,40,000	2,60,000
Total cost (Variable + Fixed)	46,00,000	50,80,000	54,00,000	55,60,000	56,40,000
Average Debtors at Cost	3,83,333	6,35,000	9,00,000	11,58,333	14,10,000
(Cost ÷ 360) × credit period					
Incremental debtors	—	2,51,667	5,16,667	7,75,000	10,26,667
Required return @ 20% (B)	—	50,333	1,03,333	1,55,000	2,05,333
Net Incremental benefits (A-B)	—	69,667	96,667	85,000	54,667

The firm should select the proposed policy II, as it is going to give highest incremental profit of ₹ 96,667. It may be noted that both the total profit analysis as well as Incremental profit analysis give the same result.

Illustration 15.9

H. Ltd. has a present annual sales of level of 10,000 units at ₹ 300 per unit. The variable cost per unit is ₹ 200 per unit and the fixed costs amount to ₹ 3,00,000 per annum. The present credit allowed by the company is one month. The company is considering a proposal to increase the credit period to two months and three months and has made the following estimates:

Credit Policy	Existing	Proposed	
	One Month	2 Months	3 Months
Increase in Sales	—	15 per cent	30 per cent
% of Bad debts	1 per cent	3 per cent	5 per cent

There will be increase in fixed cost by ₹ 50,000 on account of increase in sales beyond 15 per cent of present level. The company plans on a pre tax return of 20 per cent on investment in receivables. You are required to compute the most paying credit policy for the company.

Solution :

EVALUATION OF DIFFERENT CREDIT POLICIES

	Existing	Proposal I	Proposal II
Credit Period	1 month	2 month	3 month
No. of Units	10,000	11,500	13,000
Sales @ ₹ 300 per	₹ 30,00,000	₹ 34,50,000	₹ 39,00,000
– Variable Cost @ 200 per	₹ 20,00,000	23,00,000	26,00,000
– Fixed Cost	3,00,000	3,00,000	3,50,000
Surplus	7,00,000	8,50,000	9,50,000
– Bad Debts 1/3/5% of Sales	30,000	1,03,500	1,95,000
Profit (A)	6,70,000	7,46,500	7,55,000
Total Cost	₹ 23,00,000	₹ 26,00,000	₹ 29,50,000
Average Debtors at Cost	1,91,667	4,33,333	7,37,500
Interest Cost @ 20% (B)	38,333	86,667	147,500
Net Profit (A – B)	6,31,667	6,59,833	6,07,500
Incremental Profit	-	28,167	- 24,167

The firm may select the Proposal I to increase the credit period from 1 month to 2 month. It will give an incremental Profit of ₹ 28,167.

Illustration 15.10

ABC Ltd. manufacturers readymade garments and sells them on credit basis through a network of dealers. Its present sale is ₹ 60 lacs per annum with 20 days credit period. The company is contemplating an increase in the credit period with a view to increasing sales. Present variable costs are 70% of sales and the total fixed costs ₹ 8 lacs per annum. The company expects pre-tax return on investment @ 25%. Some other details are given as under:

Credit Policy	Average Collection Period (days)	Expected Annual Sales (₹ lacs)
I	30	65
II	40	70
III	50	74
IV	60	75

Which credit policy should the company adopt? Present your answer in a tabular form. Assume 360-days a year. Calculations should be made upto two digits after decimal.

Solution :

STATEMENT SHOWING EVALUATION OF THE PROPOSED CREDIT POLICIES (Amount in ₹ lacs)

		Proposed Policies			
Present	**Present**	**I**	**II**	**III**	**IV**
Average Collection period (days)	(20 days)	(30 days)	(40 days)	(50 days)	(60 days)
Sales (Annual)	60.00	65.00	70.00	74.00	75.00
Less: Variable cost @ 70%	42.00	45.50	49.60	51.80	52.50
Contribution	18.00	19.50	21.00	22.20	22.50
Less: Fixed costs	8.00	8.00	8.00	8.00	8.00
Profit	10.00	10.50	13.00	14.20	14.50
Incremental profit (A)	—	1.50	3.00	4.20	4.50
Investments in debtors (VC+FC)	50.00	53.50	57.00	59.80	60.50
Debtors turnover	18	12	9	7.2	6
Average debtors	2.78	4.46	6.33	8.30	10.08
Incremental investment in debtors	—	1.68	3.55	5.52	7.30
Required return on additional investment (25%):(B)	—	0.42	0.89	1.38	1.83
Incremental profit : (A)-(B)	—	1.08	2.11	2.82	2.67

Decision : The company should adopt the credit policy III (with collection period of 50 days) as it yields a maximum incremental profit to the company.

Illustration 15.11

ABC Ltd. is examining the question of relaxing its credit policy. It sells at present 20,000 units at a price of ₹ 100 per unit, the variable cost per unit is ₹ 88 and average cost per unit at the current sales volume is ₹ 92. All the sales are on credit, the average collection period being 36 days.

A relaxed credit policy is expected to increase sales by 10% and the average age of receivables to 60 days. Assuming 15% return, should the firm relax its credit policy ?

Solution :

EVALUATION OF PROPOSALS

	Present Plan (20,000 units)	Proposed Plan (22,000 units)
Sales	₹ 20,00,000	₹ 22,00,000
–Variable costs (₹ 88 per unit)	17,60,000	19,36,000
–Fixed costs (20,000 units × ₹ 4)	80,000	80,000
Net Profit	1,60,000	1,84,000
Investment cost	27,600	50,400
Income	1,32,400	1,33,600

The firm should relax its credit policy as it increases the profit by ₹ 1,200.

Working Notes :

The investment costs have been calculated as follows :

	Present Plan	Proposed Plan
Cost of sales (Variable + Fixed cost)	₹ 18,40,000	₹ 20,16,000
Average daily sale (360 days a year)	5,111	5,600
Credit period	36 days	60 days
Therefore, average debtors	1,84,000	3,36,00
Interest @ 15%	27,600	50,400

Illustration 15.12

A company currently has an annual turnover of ₹ 10,00,000 and an average collection period of 45 days. The company wants to experiment with a more liberal credit policy on the ground that increase in collection will generate additional sales. From the following information, kindly indicate which of the policies you would like the company to adopt :

Credit Policy	Increase in credit period	Increase in sales	% of Default
I	15 days	₹ 50,000	2%
II	30 days	₹ 80,000	3%
III	40 days	₹ 1,00,000	4%
IV	60 days	₹1,25,000	6%

The selling price of the product is ₹ 5, and the variable cost per unit is ₹ 3. The current bad debts loss is 1% and the required rate of return on investment is 20%. A year can be taken to comprise of 360 days.

Solution :

As the information given in this problem is in terms of incremental credit period and incremental sales, the evaluation to different credit policies may be made on incremental basis as follows :

COST OF ADDITIONAL INVESTMENT IN DEBTORS **(Figures in ₹)**

	Present Policy	Credit Policies (Proposed)			
		I	II	III	IV
Sales	10,00,000	10,50,000	10,80,000	11,00,000	11,25,000
Average Debtors	1,25,000	1,75,000	2,25,000	2,59,722	3,28,125
Additional Debtors		50,000	1,00,000	1,34,722	2,03,125
–Contribution @ 40%		20,000	40,000	53,889	81,250
Average investment in Debtors		30,000	60,000	80,833	1,21,875
Cost @ 20%		6,000	12,000	16,167	24,375

Average debtors have been calculated as : Total sales ÷ Receivables turnover. So, for the credit policy I, the total sales are ₹ 10,50,000, and the receivables turnover is 8 (*i.e.*, 360 ÷ 45). Hence the average debtors are ₹ 10,50,000 ÷ 8 = ₹ 1,75,000. For the other proposals also, the average debtors have been calculated in the same manner.

EVALUATION OF DIFFERENT CREDIT POLICIES **(Figures in ₹)**

	Present Policy	Credit Policies (Proposed)			
		I	II	III	IV
Sales	10,00,000	10,50,000	10,80,000	11,00,000	11,25,000
Additional sales (Proposed)	—	50,000	80,000	1,00,000	1,25,000
Variable cost (60% of sales)		30,000	48,000	60,000	75,000
Incremental Contribution (A)		20,000	32,000	40,000	50,000
% of default on sales	1%	2%	3%	4%	6%
Bad debts	10,000	21,000	34,200	44,000	67,500
Incremental bad debts (B)		11,000	22,400	34,000	57,500
Cost of financing (calculated as above) (C)		6,000	12,000	16,167	24,375
Total Incremental Cost (B+C)		17,000	34,400	50,167	81,875
Increase in Profit [A – (B+(C)]		3,000	–2400	–10,167	–31,875

Recommendation - First proposal of credit up to 60 days is acceptable as it is expected to result in increase in profit by ₹ 3,000 over and above the minimum required profit of 20%.

Illustration 15.13

Primer Steel Limited has a present annual Sales turnover of ₹ 40,00,000. The unit sale price is ₹ 20. The variable cost are ₹ 12 per unit and fixed costs amount to ₹ 5,00,000 per annum. The present credit period of one month is proposed to be extended to either 2 or 3 months whichever will be more profitable. The following additional information is available :

ON THE BASIS OF CREDIT PERIOD OF

	1 month	2 months	3 months
Increase in Sales by	—	10%	30%
% of Bad debts to Sales	1	2	5

Fixed cost will increase by ₹ 75,000 when sales will increase by 30%. The company requires a pre-tax return on investment at 20%.

Evaluate the profitability of the proposals and recommend best credit period for the company. *[B.Com. (H), D.U., 2014]*

Solution :

EVALUATION OF PROFITABILITY UNDER DIFFERENT CREDIT PERIODS

	One month	Two months	Three months
Sales	₹ 40,00,000	₹ 44,00,000	₹ 52,00,000
–Bad debt to sales	40,000	88,000	2,60,000
Net Sales	39,60,000	43,12,000	49,40,000
Net Incremental Sales (A)	—	3,52,000	9,80,000
Cost of Sales :			
Variable cost @ ₹ 12	24,00,000	26,40,000	31,20,000
Fixed Cost	5,00,000	5,00,000	5,75,000
Cost of Sales	29,00,000	31,40,000	36,95,000
Net Incremental Cost (B)	—	2,40,000	7,95,000
Average Debtors at cost	2,41,667	5,23,333	9,23,750
Increase in Average Debtors	—	2,81,667	6,82,083
Cost of Incremental Debtors @ 20% (C)	—	56,333	1,36,417
Total Incremental Cost (B+C)	—	2,69,333	9,31,417
Net increase in Profit [A – (B+C)]	—	55,667	48,583

The change of credit period from one month to two months is expected to increase the profit by ₹ 55,667 which is more than ₹ 48,583. So the firm may change its credit policy from the present credit period of one month to two months.

Illustration 15.14

A company offers standard credit terms of 60 days net. Its cost of short term borrowings is 16% per annum. Determine whether a 2.5% discount should be offered for payment within 7 days to customers who would normally pay after (*i*) 60 days, (*ii*) 80 days, and (*iii*) 105 days.

Solution :

The cost of using a discount to obtain funds and improve liquidity should be compared with alternative sources of finance. If the cost of short term borrowings is 16%, then cost of discount offer must be less than this, otherwise discount need not be offered. A customer who is paying after 60, 80 or 105 days involves a cost @ 16% per annum for the respective period. If the firm offers a discount @ 2.5% for payment within 7 days, then it means that 97.5% of the funds will be available for 53 days, 73 days and 98 days respectively. The percentage cost of getting funds for respective periods is ₹ 2.50/₹ 97.5. However, the annual percentage cost of the discount in each case is :

$$(a)\quad \frac{2.5}{97.5} \times \frac{365}{53} \times 100 = 17.7\%$$

$$(b)\quad \frac{2.5}{97.5} \times \frac{365}{73} \times 100 = 12.8\%$$

$$(c)\quad \frac{2.5}{97.5} \times \frac{365}{98} \times 100 = 9.5\%$$

The discount should be offered to customers who would have paid after 80 or 105 days, and not to those who would have paid after 60 days. The reason being that the cost of funds is 16% and the customers who would have paid after 60 days, would inflict a cost of 17.7% if the discount terms are offered to them.

Illustration 15.15

A company intends to produce product with its selling price of ₹ 1,000 per unit and expected annual sales of 5,000 units. Variables costs amount of ₹ 750 per unit and 2 month's credit is given to its customers. It is estimated that 10 % of customers will default, others will pay on the due date. Interest rate is 15% per annum. A credit agency has offered the company a system which it claims can help identify possible bad debts. It will cost ₹ 2,50,000 per annum to run and will identify 20 per cent of customers as being potential bad debts. If these customers are rejected, no actual bad debts will result. Should the credit system be used ? [*B.Com.(H.), D.U., 2014*]

Solution:

Existing Policy :

Sales (₹1,000×5,000)	₹50,00,000
–Bad Debts (10%)	5,00,000
Net Sales	45,00,000
–Variable cost (₹750×5,000)	37,50,000
Surplus	7,50,000
–Interest on Investment in Debtors (₹37,50,000/(2/12)×15%)	93,750
Net Surplus	6,56,250

Proposed Policy :

Sales (₹1,000×4,000)	₹40,00,000
–Variable cost (₹750×4,000)	30,00,000
–Interest on Investment in Debtors (₹30,00,000×2/12×15%)	75,000
Cost of Credit Agency	2,50,000
Net Surplus	6,75,000

Net profit due to credit Agency (₹6,75,000 – 6,56,250) ₹18,750

Comment: The firm can accept the proposal made by the Credit Agency.

OBJECTIVE TYPE QUESTIONS

State whether each of the following statements is ***True (T)*** *or* ***False (F).***

(*i*) Receivables management deals only with the collection of cash from the debtors.

(*ii*) Receivables management involves a trade off between costs and benefits of receivable.

(*iii*) The objective of a credit policy is to curtail the credit period allowed to customers.

(*iv*) Credit period allowed to customers must be equal to credit period allowed by the supplier to the firm.

(*v*) Delinquency cost refers to bad debt losses to the firm.

(*vi*) Liberalizing the discount rate means increasing the discount rate for the same period.

(*vii*) Credit evaluation of a customer is a costly process, hence it need not be undertaken by a selling firm.

(*viii*) In order to minimize the level of receivables, a firm should follow a strict and aggressive collection procedures.

(*ix*) Aging schedule of receivables is one way of monitoring the receivables.

[**Answers :** *(i) F, (ii) T, (iii) F, (iv) F, (v) F, (vi) T, (vii) F, (viii) F, (ix) T*]

MULTIPLE CHOICE QUESTIONS

1. 5 Cs of the credit does not include:
   (*a*) Collateral,
   (*b*) Character,
   (*c*) Conditions,
   (*d*) None of the above.
2. Which of the following is not an element of credit policy?
   (*a*) Credit Terms,
   (*b*) Collection Policy,
   (*c*) Cash Discount Terms,
   (*d*) Sales Price.
3. Ageing schedule incorporates the relationship between :
   (*a*) Creditors and Days Outstanding,
   (*b*) Debtors and Days Outstanding,
   (*c*) Average Age of Directors,
   (*d*) Average Age of All Employees.
4. Bad debt cost is not borne by factor in case of:
   (*a*) Pure Factoring,
   (*b*) Without Recourse Factoring,
   (*c*) With Recourse Factoring,
   (*d*) None of the above.
5. Which of the following is not a technique of receivables management?
   (*a*) Funds Flows Analysis,
   (*b*) Ageing Schedule,
   (*c*) Days sales outstanding,
   (*d*) Collection Matrix.
6. Which of the following is not a part of credit policy?
   (*a*) Collection Effort,
   (*b*) Cash Discount,
   (*c*) Credit Standard,
   (*d*) Paying Practices of debtors.
7. Which is not a service of a factor?
   (*a*) Administrating Sales Ledger,
   (*b*) Advancing against Credit Sales,
   (*c*) Assuming bad debt losses,
   (*d*) None of the above.
8. Credit Policy of a firm should involve a trade-off between increased:
   (*a*) Sales and Increased Profit,
   (*b*) Profit and Increased Costs of Receivables,
   (*c*) Sales and Cost of goods sold,
   (*d*) None of the above.
9. Out of the following, what is not true in respect of factoring?
   (*a*) Continuous Arrangement between Factor and Seller,
   (*b*) Sale of Receivables to the factor,
   (*c*) Factor provides cost free finance to seller,
   (*d*) None of the above.
10. Payment to creditors is a manifestation of cash held for:
   (*a*) Transactionery Motive,
   (*b*) Precautionary Motive,
   (*c*) Speculative Motive,
   (*d*) All of the above.
11. If the closing balance of receivables is less than the opening balance for a month then which one is true out of:
   (*a*) Collections > Current Purchases,
   (*b*) Collections > Current Sales,
   (*c*) Collections < Current Purchases,
   (*d*) Collections < Current Sales.
12. If the average balance of debtors has increased, which of the following might not show a change in general?
   (*a*) Total Sales,
   (*b*) Average Payables,
   (*c*) Current Ratio,
   (*d*) Bad Debt loss.
13. Securitization is related to conversion of:
   (*a*) Receivables,
   (*b*) Stock,
   (*c*) Investments,
   (*d*) Creditors.
14. 80% of sales of ₹ 10,00,000 of a firm are on credit. It has a Receivable Turnover of 8. What is the Average collection period (360 days a year) and Average Debtors of the firm?
   (*a*) 45 days and ₹ 1,00,000,
   (*b*) 360 days and ₹ 1,00,000,
   (*c*) 45 days and ₹ 8,00,000,
   (*d*) 360 days and ₹ 1,25,000.
15. In response to market expectations, the credit period has been increased from 45 days to 60 days. This would result in:
   (*a*) Decrease in Sales,
   (*b*) Decrease in Debtors,
   (*c*) Increase in Bad Debts,
   (*d*) Increase in Average Collection Period.

16. If a company sells its receivable to another party to raise funds, it is known as:
   (*a*) Securitization,
   (*b*) Factoring,
   (*c*) Pledging,
   (*d*) None of the above.
17. Cash Discount term 3/15, net 40 means:
   (*a*) 3% Discount if payment in 15 days, otherwise full payment in 40 days,
   (*b*) 15% Discount of payment in 3 days, otherwise full payment in 40 days,
   (*c*) 3% Interest if payment made in 40 days and 15% interest thereafter,
   (*d*) None of the above.
18. If the sales of the firm are ₹ 60,00,000 and the average debtors are ₹ 15,00,000 then the receivables turnover is :
   (*a*) 4 times
   (*b*) 25%
   (*c*) 400%
   (*d*) .25 times
19. If cash discount is offered to customers, then which of the following would increase ?
   (*a*) Sales
   (*b*) Debtors
   (*c*) Debt collection period
   (*d*) All of the above
20. Receivables Management deals with :
   (*a*) Receipts of raw materials
   (*b*) Debtors collection
   (*c*) Creditors Management
   (*d*) Inventory Management

[**Answers :** *1. (d), 2. (d), 3. (b), 4. (c), 5. (a), 6. (d), 7. (d), 8. (b), 9. (c), 10. (a) 11. (b), 12. (b), 13. (a), 14. (a), 15. (d), 16. (b), 17. (a), 18. (a), 19. (a), 20. (b)*].

ASSIGNMENTS

1. Write short notes on :
   (*a*) Credit evaluation of customers.
   (*b*) Optimal credit policy.
   (*c*) Annualised cost of cash discount.
   (*d*) Credit policy. *[B.Com. (H), D.U., 2015]*
2. Explain the objectives of credit policy of a firm. *[B.Com. (H), D.U., 2008]*
3. What is credit policy ? What are the elements of a credit policy ?
4. What are the costs and benefits associated with liberal credit policy ? *[B.Com. (H), D.U., 2011]*
5. What are the costs and benefits associated with a change in credit policy ? *[B.Com. (H), D.U., 2013]*
6. What are credit terms ? Explain the role of credit terms in a credit policy.
7. State the role which receivables play in the overall financial picture of the firm.
8. What are the techniques of control of receivables ? Explain the "Aging Schedule".
9. "Average age of receivables is an important yardstick of testing the efficiency of receivables management." Explain.
10. Discuss the consequences of lengthening and shortening of the credit period by a firm. *[B.Com. (H), D.U., 2012, 2013]*

PROBLEMS

P15.1 A company sells a product @ ₹ 30 per unit with a variable cost of ₹ 20 per unit. The fixed costs amount to ₹ 6,25,000 per annum and the total annual sales to ₹ 75 lacs. It is estimated that if the present credit facility of one month is doubled, sales could be increased by ₹ 6,00,000 per annum, the company expects a return on investment of at least 20% prior to taxation. Justify by calculation that this course can be adopted.

[*Answer :* The credit period may be doubled as it will result in net increase is profit by ₹ 92,917].

P15.2 ABC Ltd. has currently an annual credit sales of ₹ 8,00,000. Its average age of accounts receivables is 60 days. It is contemplating a change in its credit policy that is expected to increase sales to ₹ 10,00,000 and increase the average age of accounts receivables to 72 days. The firm's sale price is ₹ 25 per unit, the variable cost per unit is ₹ 12 and the average cost per unit at ₹ 8,00,000 sales volume is ₹ 17. Assume a 360-day year, and calculate the following :

(*i*) What is the average accounts receivable with both the present and the proposed plans ?

(*ii*) What is the cost of marginal investment, if the assumed rate of return is 15%?

[*Answer :* Average investment in debtors in existing and proposed plan is ₹ 90,667 and ₹ 1,28,000 respectively. So, the marginal increase is (1,28,000 – 90,667) = ₹ 37,333 and its cost @ 15% is ₹ 5,600.

P15.3 PQR Ltd. is considering relaxing its credit policy and evaluating two proposed policies. Currently, the firm has annual credit sales of ₹ 50 lacs and Accounts

receivables of ₹ 12,50,000. The current level of loss due to bad debts is ₹ 1,50,000. The firm is to give a return of 20% on investment in the new (additional) accounts receivables. The company's variable costs are 70% of the selling price. The following further information is furnished :

	Present Policy	Policy option I	Policy option II
Annual credit sales	₹ 50,00,000	₹ 60,00,000	₹ 67,50,000
Accounts receivables	12,50,000	20,00,000	28,12,500
Bad debt losses	1,50,000	3,00,000	4,50,000

You are the management accountant of the firm. Advise the MD which option should be adopted.

[*Answer :* Policy Option I may be adopted, as it is expected to increase profit by ₹ 45,000]

P15.4 A company's present sale is ₹ 40 lacs per annum with 20 days credit period, present variable cost are 70% of sales and total fixed cost ₹ 6 lacs per annum. The company expects pretax return on investment @ 25%. Some other details in respect to increase in the credit period with a view to increase sales are given as under :

Credit Policy	Average Collection Period (Days)	Expected Annual Sales (₹)
I	36	44 lac
II	40	50 lac
III	45	52 lac
IV	50	60 lac
V	60	75 lac

Which credit policy should the company adopt ? Assuming 360 days a year.

[*Answer* : Credit Policy V is best]

P15.5 ABC company's present annual sales amount to ₹ 30 lacs at ₹ 12 per unit. Variable costs are ₹ 8 per unit and fixed costs amount to ₹ 2.50 lacs per annum. Its present credit period of one month is proposed to be extended to either 2 or 3 months, whichever appears to be more profitable.

The following estimates are made for the purpose :

Credit Policy	1 month	2 months	3 months
Increase in Sales (%)	—	8	30
% of Bad debt to sales	1	3	6

Fixed cost will increase by ₹ 50,000 annually after any increase in sales above 25% over the present level. The company requires a pre tax return on investment of at least 20% for the level of risk involved. What will be the most rewarding credit policy in case of ABC company under the above circumstances ? Present your answer in a tabular form.

[*Answer :* Contribution is 1/3 of sales. The present policy is the best. The proposals of 2 months and 3 months credit are not justified as the return on additional investment is not 20%]

P15.6 Super Sports Co., dealing in sports goods, have an annual sale of ₹ 50,00,000 and are currently extending 30 day's credit to the dealers. It is felt that sales can pick up considerably if the dealers are willing to carry increased stock, but the dealers have difficulty in financing their inventory. Super Sports Co. is, therefore considering a shift in credit policy.

The following information is available :

The average collection period now is 30 days.

Costs : Variable cost 80% of sales.

Fixed cost ₹ 6 lac per annum.

Required pre tax return an investment = 20%

Credit Policy	Average collection period	Annual Sales (₹ in lacs)
A	45 days	56
B	60 days	60
C	75 days	62
D	90 days	63

Determine which policy should be adopted by the company on the basis of (*i*) Total Profit, and (*ii*) Incremental Profit.

[*Answer :* The credit policy B may be adopted as it is giving highest return among all the 4 proposed policies.]

P15.7 A company currently has annual sales of ₹ 5,00,000 and an average collection period of 30 days. It is considering a more liberal credit policy. If the credit period is extended, the company expects sales and bad debt losses to increase in the following manner :

Credit Policy	Increase in credit Period	Increase in Sales ₹	Bad-debt % of Total Sales
A	10 days	25,000	1.2
B	15 days	35,000	1.5
C	30 days	40,000	1.8
D	42 days	50,000	2.2

The selling price per unit is ₹ 2. Average cost per unit at the current level of operation is ₹ 1.50 and variable cost per unit is ₹ 1.20. If the current bad-debt loss is 1% and the required rate of return investment is 20%, which credit policy should be undertaken? Ignore taxes, and assume 360 days in a year.

[*Answer :* The firm should extend the credit period by another 15 days only. This will give the maximum incremental profit.]

CHAPTER

16

Inventory Management

"Inventories are assets of the firm, and as such they represent an investment. Because such investment requires a commitment of funds, managers must ensure that the firm maintains inventories at the correct level. If they become too large, the firm loses the opportunity to employ those funds more effectively. Similarly, if they are too small, the firm may lose sales. Thus, there is an optimal level of inventories and there is an economic order quantity model for determining the correct level of inventory."[1]

SYNOPSIS

- Types of Inventories.
- Inventory Management.
- Reasons and Benefits of Inventory.
- Costs of Maintaining Inventory.
  - Carrying Costs.
  - Cost of Ordering.
  - Cost of Stock-out : A Hidden Costs.
- Techniques of Inventory Management.
  - ABC Analysis.
  - The EOQ Model.
  - The Re-order Level.
  - The Safety Stock.
  - Quantity Discount and Order Quantity.
  - Graded Illustrations in Inventory Management.

1. Kolb R.W. and Rodriguez R.J., *Financial Management,* Black Well Publishers Limited, Cambridge, U.K., 1996, p. 239.

Inventories are assets of the firm and require investment and hence involve the commitment of firm's resources. The inventories need not be viewed as an idle assets rather these are an integral part of firm's operations. But the question usually is as to how much inventories be maintained by a firm? If the inventories are too big, they become a strain on the resources, however, if they are too small, the firm may lose the sales. Therefore, the firm must have an optimum level of inventories. Managing the level of inventories is like maintaining the level of water in a bath tub with an open drain. The water is flowing out continuously. If water is let in too slowly, the tub is soon empty, it water is let in too fast, the tub over flows. Like the water in the tub, the particular item in the inventory keeps changing, but the level may remain the same. The basic financial problem is to determine the proper level of investment in the inventories and to decide how much inventory must be acquired during each period to maintain that level. The present chapter attempts to discuss different aspects of inventory management.

TYPES OF INVENTORIES

The inventory means and includes the goods and services being sold by the firm and the raw materials or other components being used in the manufacturing of such goods and services. A retail shopkeeper keeps an inventory of finished goods to be offered to customers whenever demanded by them. On the other hand, a manufacturing concern has to keep a stockpile of not only the finished goods it is producing, but also of all physical ingredients being used in the production process.

The common types of inventories for most of the business firms may be classified as finished goods, work-in-progress and raw materials.

Finished Goods: These are the goods which are either being purchased by the firm or are being produced or processed in the firm. These are just ready for sale to customers. Inventories of finished goods arise because of the time involved in production process and the need to meet customer's demand promptly. If the firms do not maintain a sufficient finished goods inventory, they run the risk of losing sales, as the customers who are unwilling to wait may turn to competitors. The purpose of finished goods inventory is to uncouple the production and sales function so that it is not necessary to produce the goods before a sales can occur and therefore sales can be made directly out of inventory.

Work-in-Progress: It refers to the raw materials engaged in various phases of production schedule. The degree of completion may be varying for different units. Some units might have been just introduced, while some others may be 40% complete or others may be 90% complete. The work-in-progress refers to partially produced goods. The value of work-in-progress includes the raw material costs, the direct wages and expenses already incurred and the overheads, if any. So, the work-in-progress inventory contains partially produced/completed goods.

The quantity and the value of work-in-progress depend on the length of the production cycle. In case of shorter production cycle, the work-in-progress may be small but if the production cycle is lengthy, the firm will be having a large work-in-progress. The more complex and lengthy the production process, the larger the investment in work-in-progress inventory. The purpose of work-in-progress inventory is to uncouple the various operations in the production process so that machine failures and stoppages in one operation will not affect the other operations.

Raw Materials: The raw materials include the materials which are used in the production process and every manufacturing firm has to carry certain stock of raw materials in stores. These units of raw materials are regularly issued/transferred to production department. Inventories of raw materials are held to ensure that the production process is not interrupted by a shortage of these materials. The amount of raw materials to be kept by a firm depends on a number of factors, including the speed with which raw materials can be ordered and procured (the greater the speed, the lower the required inventory for raw material) and the uncertainty in the supply of these raw materials (the larger the uncertainty, the greater the need for raw materials inventory). Its purpose is to uncouple the production function from the purchasing function *i.e.*, to make these two functions independent of each other so that delay in procurement of raw materials do not cause production delays and the firm can satisfy its need for raw materials out of the inventory lying in the stores.

The classification of a particular item as a finished goods or raw material depends on the kind of business being discussed. For a coal mining firm, coal is a finished good but it is a raw material for a steel mill as the coal is used in the production of steel. Similarly, steel is a finished good for a steel mill but it is a raw material for an automobile firm.

INVENTORY MANAGEMENT

It is already noted that the purpose of carrying inventory is to uncouple the operations of the firm *i.e.*, to make each function of the firm independent of other functions so that delays in one area do not affect the production and sales activities. As the production shut down results in increased costs and because the delays in delivery can result in loosing the customers, the management and control of inventory is an important dimension of the duties of the financial manager. Inventory management assumes significance in any firm and it is of great concern to any financial manager. Though the inventory is more directly related to production and marketing departments, still the financial managers has to play an active role in the management of inventory. He in fact, is the decision maker in the whole process of inventory management.

Any firm will like to hold higher levels of inventory. This will enable the firm to be more flexible in supplying to the customers and will find ease in its production schedule. Most of the customers may require immediate delivery and higher inventories may help meeting their demands, and hence there would be less and less chances of sales being disrupted. But there is always a cost involved in the inventories. This cost includes the capital cost of the stock and the costs of storing

and carrying, *etc.* On the other hand, holding lower level of stock than required may result in stock-outs. The cost of stock-out may be sales loss or customer's dissatisfaction. The stock-outs may also result in delays or hold-ups in the production process.

Given the benefits of holding inventories and costs of stock-outs, a firm will be tempted to hold maximum possible inventories. But this is costly too, because the funds blocked in inventory always have an opportunity cost. So, every firm is required to manage the inventories in such a way as to get the best return thereof. It must weigh the benefits of holding inventory against its opportunity costs. While achieving the objective of optimum level of inventory, a financial manager has to reconcile the differing view points of production department, marketing department and the finance department. No doubt, most of the decisions relating to inventories are taken by purchase department in consultation with the production department, still the financial manager should ensure that the inventories are properly controlled and he should stress the need for the consideration of financial implications of inventory management.

Thus, the objective of inventory management is to determine the optimum level of inventory *i.e.*, the level at which the interest of all the departments are taken care of. The inventory management seeks to maximize the wealth of the shareholders by designing and implementing such policies which attempt to minimize the cost of procuring and maintaining the inventories.

Business firms keep inventories for different purposes. Every firm, big or small, trading or manufacturing has to maintain some minimum level of inventories. There are different motives for maintaining inventories, and these are more or less the same as the motives for holding cash. The motives for holding inventory may be enumerated as follows:

1. ***Transactionary Motive:*** Every firm has to maintain some level of inventory to meet the day to day requirements of sales, production process, customer demand etc. This motive makes the firm to keep the inventory of finished goods as well as raw materials. The inventory level will provide a smoothness to the operations of the firm. A business firm exists for business transactions which require stock of goods and raw materials.
2. ***Precautionary Motive:*** A firm should keep some inventory for unforeseen circumstances also. For example, the fresh supply of raw material may not reach the factory due to strike by the transporters or due to natural calamities in a particular area. There may be labour problem in the factory and the production process may halt. So, the firm must have inventories of raw materials as well as finished goods for meeting such emergencies.
3. ***Speculative Motive:*** The firm may be tempted to keep some inventory in order to capitalize an opportunity to make profit *e.g.*, sufficient level of inventory may help the firm to earn extra profit in case of expected shortage in the market.

Reasons and Benefits of Inventories: The motives discussed above make the firm to hold the inventory. However, as already said, the inventory has costs as well as benefits associated with it. While determining the optimal level of inventories, the financial manager must consider the necessity of holding inventory and costs thereof. The optimum level of inventory is a subjective matter and depends upon the features of a particular firm. The following are some of the benefits or reasons for holding inventories:

I. Trading Firm: In case of a trading firm, there may be several reasons why it will maintain inventory. If the firm has some stock of goods then the sales activity can be undertaken even if the procurement has stopped due to one reason or the other. Otherwise, if stock is not there, there is a likelihood that the sales will stop as soon as there is an interruption in procurement. Moreover, it is not always possible to procure the goods whenever there is a sales opportunity, as there is always a time gap required between the purchase and sale of goods. Thus, a trading concern should have some stock of finished goods in order to undertake sales activities independent of the procurement schedule.

Similarly, a firm may have several incentives being offered in terms of quantity discount or lower price, etc., by the supplier of goods. The benefits can be availed and goods may be purchased even if there is no immediate sales order. The inventory so purchased, at a discount/lower cost, will result in lowering the total cost resulting in higher profit for the firm. So, in case of trading concern, the inventory helps in de-linking the sales activities from purchase activity and also to capitalize a profit of opportunity.

II. Manufacturing Firm: A manufacturing firm should have inventory of not only the finished goods, but also of raw materials and work-in-progress for obvious reasons as follows:

(*i*) *Uninterrupted Production Schedule:* Every manufacturing firm must have sufficient stock of raw materials in order to have the regular and uninterrupted production schedule. If there is stock-out of raw material at any stage of production process, then the whole production process may come to a halt. This may result in customer dissatisfaction as the goods cannot be delivered in time. Moreover, the fixed costs will continue to be incurred even if there is not production. The firm may also have to incur heavy cost to restart the production schedule.

Further, sufficient work-in-progress would let the production process run smoothly. In most of the manufacturing concerns, the work-in-progress is a natural outcome of the production schedule. The work-in-progress helps in fulfilment of some sales orders even if the supply of raw material has stopped.

(*ii*) *Independent Sales Activity :* Inventory of finished goods is required not only in a trading concern, but manufacturing firms should also have sufficient stock of finished goods. The production schedule is

generally a time consuming process and in most of the cases goods cannot be produced just after receiving orders. Every manufacturing concern therefore, maintains a minimum level of finished goods in order to deliver the goods as soon as the order is received.

Costs of Inventory: Every firm maintains some stock of raw materials, work-in-progress and finished goods depending upon the requirement and other features of the firm. It is benefited by holding inventory, no doubt, yet it must also consider various costs involved in holding inventories. Had these costs not there, there would not have been any problem of inventory management and every firm would have maintained a higher and higher level of inventories. The cost of holding inventories may include the followings:

1. **Carrying Cost:** This is the cost incurred in keeping or maintaining an inventory of one unit of raw material or work-in-progress or finished goods. Two basic costs are associated with holding a unit in inventory. These are:

   (*a*) *Cost of storage:* This means and includes the cost of storing one unit of raw material by the firm. This cost may be in relation to rent of space occupied by the stock, the cost of people employed for the security of the stock, cost of infrastructure required *e.g.,* air conditioning, etc., cost of insurance, cost of pilferage, warehousing cost, handling cost, etc.

   (*b*) *Cost of financing:* This cost includes the cost of funds invested in the inventories. The funds used in the purchase/production of inventories have an opportunity cost *i.e.*, the income which could have been earned by investing these funds elsewhere. Moreover, if the firm has to pay interest on borrowings made for the purchase of materials/goods, then there is an explicit cost of financing in the form of interest.

   It may be noted that the total carrying cost is entirely variable and rise in direct proportion to the level of inventories carried. The total carrying cost move in the same direction as the annual average inventory.

2. **Cost of Ordering:** The cost of ordering include the cost of acquisition of inventories. It is the cost of preparation and execution of an order, including cost of paper work and communicating with the supplier. There is always minimum cost involved whenever an order for replenishment of goods is placed. The total annual cost of ordering is equal to the cost per order multiplied by the number of order placed in a year. The number of orders determines the average inventory being held by the firm. Therefore, the total order cost is inversely related to the average inventory of the firm. The ordering cost may have a fixed component which is not affected by the order size; and a variable component which changes with the order size. For example, transportation charges may be payable per unit subject to a minimum charge per trip.

   The carrying cost and the cost of ordering are the opposite forces and collectively they determine the level of inventories in any firm. The carrying cost considerations require that the firms should maintain the inventories at the lowest level and should be replenished as frequently as possible. This will result in lowering of the total carrying cost. But this also requires frequent order to be replaced and therefore, results in increasing the total cost of ordering. A financial manager has to achieve a trade-off between the carrying cost and the cost of ordering.

3. **Cost of Stock-outs (A hidden cost):** A stock-out is a situation when the firm is not having units of an item in store but there is a demand for that either from the customers or the production department. The stock-outs refer to demand for an item whose inventory level has already reduced to zero or insufficient level. It may be noted that the stock out does not appear if the item is not demanded even if the inventory level has fallen to zero. There is always a cost of stock-out in the sense that the firm faces a situation of lost sales or back orders. Further that stock-out of some item may result in lost sales of not only that out of stock item, but also for other related items.

   Stock-outs are quite often expensive. If the inventory item is a finished goods, the customer may buy the goods from someone else. This will result in profit lost on such lost sales. Even if the customer is willing to wait until the goods arrive, some goodwill is definitely lost. If the firm is often not able to supply goods when the customers demand, its reputation suffers and it will lose business. Stock-out of raw materials or work-in-progress can cause the production process to stop. This will be expensive because employees will be paid for the time not spent in producing goods. Some production processes are so expensive to shut down that the management will go to great lengths to avoid to running out of materials.

   So, the trade-off on inventory is fairly clear. On the one hand, having too high an investment in inventory results in large carrying costs which, will drag down the value of the firm. On the other hand, having too small an inventory results in either lost sales or higher ordering costs for the firm. On the basis of the above discussion, the whole theory of inventory management can be summarized as follows:

   (*i*) Maintaining sufficient stock of raw materials ensuring continuous supply to production process for uninterrupted production schedule,

   (*ii*) Maintaining sufficient supply of finished goods for achieving smooth sales operations, and

   (*iii*) Minimizing the total annual cost of maintaining inventories.

   In order to ensure the above, various steps are required. In the following section, some of the techniques of inventory management are discussed.

TECHNIQUES OF INVENTORY MANAGEMENT

As in the case of other current assets, the decision making in investment in inventory involves a basic trade-off between risk and return. The risk is that if the level of inventory is too

low, the various functions of the business do not operate independently. The return results because lower level of inventory saves money. As the size of the inventory increases, the storage and other costs also rise. Therefore, as the level of inventory increases, the risk of running out of inventory decreases but the cost of carrying inventory increases. Out of different current assets being maintained by the firm, inventory is one which requires to be monitored and managed not only in terms of money value but also in terms of number of physical units. The financial manager must see that the inventory does not become unnecessarily large when compared with the requirements; and for this, close control over the size and composition of inventories must be maintained. Moreover, since the investment in inventories is the least liquid of all the current assets, any error in its management cannot be readily rectified and hence may be costly to the firm. The goal of inventory management should therefore, be established a level of each item of the inventory.

There should be a systematic approach to inventory management which must attempt to balance out the expected costs and benefits of maintaining inventories. In order to ensure efficient management of inventories, the finance manager may be required to answer the following questions:

1. Are all items of inventories equally important, or some of the items are to be given more attention?
2. What should be the size of each order or each replenishment?
3. At what level should the order for replenishment be placed?

Various techniques has been suggested to deal with these problems. Some of these has been discussed as follows:

ABC Analysis: The ABC analysis is based on the propositions that (*i*) managerial time and efforts are scare and limited, and (*ii*) some items of inventory are more important than others. The ABC analysis classifies various inventory items into three sets or groups of priority and allocates managerial efforts in proportion of the priority. The most important items are classified as class A, those of intermediate importance are classified as class B and the remaining items are classified as class C. The financial manager should monitor different items belonging to different groups in that order of priority. Utmost attention is required for class A item, followed by items in class B and then items in class C.

Under ABC analysis, the different items may be placed in different groups as follows:

1. Different items are given priority order on the basis of total value of annual consumption. Item with the highest value is given top priority and so on. The annual consumption value of all the items, already arranged in priority order, are then shown in cumulative terms for each and every item.
2. Thereafter, the running cumulative totals of annual value of consumption are expressed as a percentage of total value of consumption.
3. Then these cumulative percentage of consumption values are divided into three categories *i.e.*, A, B and C. Usually, group A is consisting of items having cumulative percentage value of 60% to 70%; group B is consisting of next 20% to 25% and the remaining items are placed in group C. The ABC analysis of inventory management has been explained with the help of Example 16.1.

Example 16.1

The following is the information regarding the consumption and price per unit of different items of inventory. Classify the items as per ABC analysis.

Item No.	Consumption (Annual)	% of Total units	Rate (per unit)	Total Value
I	6,000	6%	₹ 100	₹ 6,00,000
II	10,000	10%	65	6,50,000
III	5,000	5%	50	2,50,000
IV	25,000	25%	2	50,000
V	4,000	4%	25	1,00,000
VI	15,000	15%	10	1,50,000
VII	25,000	25%	6	1,50,000
VIII	10,000	10%	5	50,000
Total	1,00,000	100%		20,00,000

Solution:

Under ABC analysis the annual value for different items are to be placed in order of decreasing total value and then cumulative values are to be ascertained. These cumulative values are then transformed into percentage of cumulative values and then the classification into groups A, B and C is made. This has been done in the following table.

Priority order	Item No.	Annual value	Cumulative annual value	Cumulative percentage	% of items
1	II	₹ 6,50,000	₹ 6,50,000	32.5%	10%
2	I	6,00,000	12,50,000	62.5%	6%
3	III	2,50,000	15,00,000	75.0%	5%
4	VI	1,50,000	16,50,000	82.5%	15%
5	VII	1,50,000	18,00,000	90.0%	25%
6	V	1,00,000	19,00,000	95.0%	4%
7	IV	50,000	19,50,000	97.5%	25%
8	VIII	50,000	20,00,000	100.0%	10%

In this case, item numbers VI and VII constitute 40% of the total number of units consumed during the year, but cost wise these items constitute only 15% of the total costs. Similarly, items numbers IV, V and VIII constitute 39% of the total number of units consumed, but cost wise, these items constitute only 10% of the total cost. On the other hand, items numbers I, II and III constitute only 21% of the number of items consumed but accounts for 75% of the total cost. Thus, items I, II and III have been placed in group A and require maximum attention. Since, the cost involved for group A items is substantial (*i.e.*, 75% of the total value), therefore, more time of the financial manager should be devoted to the management of these items as compared to items of group B and group C, which have the total value of 15% and 10% respectively of the total annual value.

Under ABC analysis an item is included in the group on the basis of attention it requires. The ABC analysis thus, helps allocating managerial efforts in proportion to the importance

of various items of inventory. The ABC analysis can also be presented graphically to have visual of importance of different items. Figure 16.1 shows the graphical presentation of ABC analysis in respect of Example 16.1.

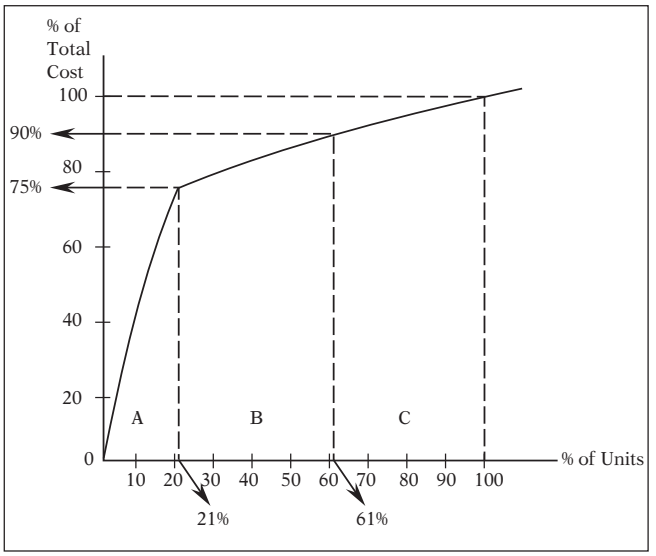

FIGURE 16.1: GRAPHICAL PRESENTATION OF ABC ANALYSIS

ECONOMIC ORDER QUANTITY MODEL: The importance of effective inventory management is directly related to the size of the inventory. Effective management of inventory is essential to the objective of maximization of shareholders wealth. To control the investment in inventory, the financial manager must solve two interrelated problems: (*i*) the order quantity problem, and (*ii*) the order point problem. The inventory management basically focus on maintaining an optimum level of inventory in order to minimize the costs attached with different inventory levels. Average level of inventory, to a great extent, depends upon the number of units procured in one lot and then the speed at which these units are used or sold. The average level can be optimized by careful analysis of quantity ordered, the carrying cost of each unit and the annual requirement of different items.

The Economic Order Quantity (EOQ) model attempts to determine the orders size that will minimize the total inventory costs. It assumes that total inventory cost = Total carrying cost + Total ordering cost. The EOQ model as a technique of inventory management defines three parameters for any inventory item.

1. Minimum level of inventory of that item depending upon the usage rate of that item, time lag in procuring that item and unforeseen circumstances, if any.
2. The re-order level of that item, at which next order for that item must be placed to avoid any chance of a stock-out, and
3. The re-order quantity for which each order must be placed.

The EOQ model attempts to determine quantity to be ordered at a time so as to optimize the cost of carrying and holding inventory and also ensuring availability of that item whenever needed. The most economic size of the order is determined by considering the cost of carrying the inventory, its purchasing, its ordering costs and usage rate. The EOQ model is based on the following assumptions :

(*a*) The total usage of a particular item for a given period (usually a year) is known with certainty and that the usage rate is even through out the period.

(*b*) That there is no time gap between placing an order and getting its supply.

(*c*) The cost per order of an item is constant and the cost of carrying inventory is also fixed and is given as a percentage of average value of inventory.

(*d*) That there are only two costs associated with the inventory, and these are the cost of ordering and the cost of carrying the inventory.

Given the above assumption, the EOQ model may be presented as follows:

$$EOQ = \sqrt{\frac{2AO}{C}}$$

or, $EOQ = [(2AO)/C]^{1/2}$

where, EOQ = Economic quantity per order.

A = Total Annual requirement for the item

O = Ordering cost per order of that item

C = Carrying cost per unit per annum.

Assuming that inventory is allowed to fall to zero and then is immediately replenished, the average inventory becomes EOQ/2. The EOQ model can also be presented graphically as in Figure 16.2.

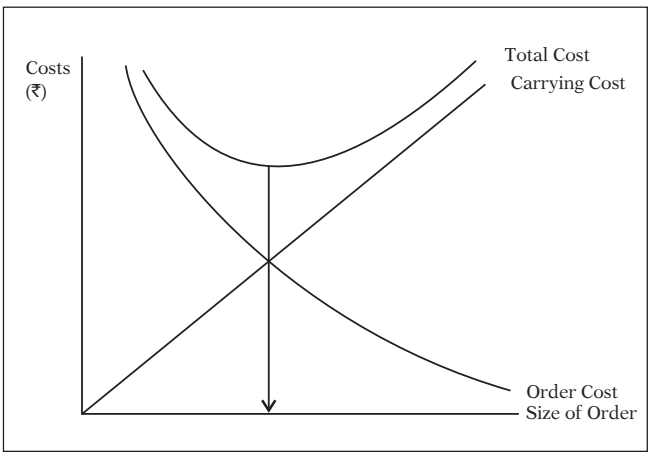

FIGURE 16.2: GRAPHICAL PRESENTATION OF THE EOQ MODEL.

Figure 16.2 shows that the total ordering cost for any particular item is decreasing as the size per order is increasing. This will happen because with the increase in size of the order, the total number of orders for a particular item will decrease resulting in decrease in the total order cost. The total annual carrying cost is increasing with the increase in order size. This will happen because the firm would be keeping more and more items in the stores. However, the total cost of inventory

(*i.e.*, the total carrying cost + the total ordering cost) initially reduces with the increase in size of order but then increases with the increase in size of order. The trade-off of these two costs is attained at the level at which the total annual cost is the least. At this particular level, the order size is designated as the economic order quantity. If the firm places the orders for that item of this economic order quantity, then the total annual cost of inventory of that item will be minimized. Example 16.2 explains the EOQ model.

Example 16.2

The following information is available in respect of an item:

Annual usage, A = 20,000 units
Ordering cost, O = ₹ 1,875 per order
Carrying cost, C = ₹ 3 per unit/per annum

Find out the economic order quantity of the item and also verify the results.

Solution:

The economic order quantity for the item may be calculated as follows:

$$EOQ = \sqrt{\frac{2AO}{C}}$$

or, $EOQ = [(2AO)/C]^{½}$

where, EOQ = Economic quantity per order.
A = Total Annual requirement for the item
O = Ordering cost per order of that item
C = Carrying cost per unit per annum.

Now, $EOQ = [(2AO)/C]^{1/2}$
$= [(2 \times 1,875 \times 20,000)/3]^{1/2}$
= 5,000 units.

And the number of orders in a year would be 20,000/5,000 = 4. The result can be verified as follows:

(*i*) **If the order size is 5,000 units:**

Total order cost = ₹ 1,875 × 4 = ₹ 7,500
Average inventory = 2,500 (*i.e.*, 5,000/2)
Total carrying cost = Ave. inventory × ₹ 3
= 2,500 × ₹ 3 = ₹ 7,500
Total annual cost ₹ 15,000

(*ii*) **If the order size is 4,000 units:**

Number of orders = 5 (*i.e.*, 20,000/4,000)
Total order cost = ₹ 1,875 × 5 = ₹ 9,375
Average inventory = 2,000 (*i.e.*, 4,000/2)
Total carrying cost = Ave. inventory × ₹ 3
= 2,000 × ₹ 3 = ₹ 6,000
Total annual cost ₹ 15,375

(*iii*) **If the order size is 6,667 units:**

Number of orders = 3(*i.e.*, 20,000/6,667)
Total order cost = ₹ 1,875 × 3 = ₹ 5,625
Average inventory = 3,333(*i.e.*, 6,667/2)
Total carrying cost = Ave. inventory × ₹ 3
= 3,333 × ₹ 3 = ₹ 10,000
Total annual cost ₹ 15,625

It may be noted that the total cost of inventory is the least when the quantity per order is 5,000 units as given by the EOQ model. If the quantity per order is increased, the total cost also increases; and if the quantity per order is less than the economic order quantity then the cost is still more. The reason being that the economic order quantity, as given by the EOQ model balances the carrying cost and the ordering cost. The total cost at any other size would be more than the total cost at the economic order quantity.

The EOQ model is a useful technique of inventory management as it tells the quantity to order and also the time to order. It helps in deciding when to replenish the inventory and also the quantity to be replenished. However, the EOQ model suffers from various shortcomings, particularly the unrealistic assumptions.

1. The total usage of an item during a particular period is difficult to be known with certainty. In most of the cases, the actual demand/use of an item may fluctuate during any particular period. Although, the EOQ model assumes constant demand, however, the demand may vary from day to day. If the demand is not precisely known in advance, then the model must be modified through the inclusion of safety stock, as discussed later.
2. The assumption of no time gap between placing an order and getting its supply is also not realistic. The supply of an item may not immediately reach the firm as soon as the inventory level reaches zero and the order is placed. Consequently, the inventory level as per EOQ model may drop to zero before the new replenishment is received.
3. Another shortcoming of the EOQ model is that the quantity given by the EOQ model may be hypothetical. For example, order cannot be placed for fractional unit, say 437.25 units. Quite often, the order can be placed only in a particular multiple size, *e.g.*, in multiple of dozens, or 10's or 100's.
4. The EOQ model also assumes that the ordering cost are fixed and are not a function of the size of the order. This is unlikely to be true when there are economies of scale or quantity discounts associated with larger orders. However, the quantity discounts can be handled through a modifications of the original EOQ model, redefining total cost and solving for the optimum order quantity. This has been discussed later.
5. The carrying cost may also vary substantially as the size of the inventory rises because of economies of scale or the storage efficiency. If it is so, then the EOQ model may not give the desired results.

The shortcomings of the EOQ model stated above can be overcome to some extent by modifying some of the assumptions of the model. The assumption of immediate replenishment can be eliminated by preparing (advancing) the place-

ment of an order by a few days before the actual inventory level reaches zero. The firm may maintain a safety inventory which would cover the demand while the supply is being replenished. The size of the safety inventory is an increasing function of the time it takes to replenish the inventory and of the uncertainty associated with the demand. The firm may decide a re-order level, at which the next order is to replaced. This re-order level will then depend upon the expected usage rate and the time gap. So, the safety stock and the re-order level can take care of the problem of instantaneous replenishment. However, the safety stock level depends upon the cost of carrying additional inventory and the cost of stock-out. The safety stock level and the re-order level have been discussed as follows:

RE-ORDER LEVEL: The re-order level is the level of inventory at which the fresh order for that item must be placed to procure fresh supply. The re-order level depends upon:

(*a*) Length of time between the placement of an order and receiving the supply, and

(*b*) The usage rate of the item. The inventory is constantly being used up. This is true regardless of the type of inventory. Raw materials and work-in-progress inventories are being used in the production while the finished goods are being sold regularly. The rate at which the inventory is being used up is called the usage rate. The re-order level can be determined as follows:

$$R = M + tU$$

where, R = Re-order level
M = Minimum level of inventory
t = Time gap/delivery time, and
U = Usage rate

The re-order level and the inventory patterns have been shown in Figure 16.3.

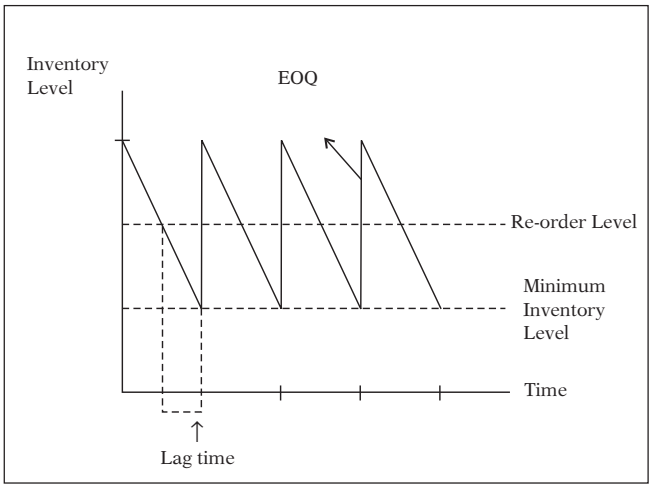

FIGURE 16.3: THE RE-ORDER LEVEL AND THE INVENTORY PATTERN.

Figure 16.3 shows that if the usage rate is constant, the orders are made at even intervals for the same amounts each time, and inventory goes to zero just before an order is received. In this case, the number of units in inventory will be as shown in Figure 16.3. For example, suppose that the usage rate is 1,200 units per year (100 per month) and orders of 100 units are placed every month. When an order is received, there will be Q = 100 units in stock. The amount in stock will be reduced, on an average, 100 units/ 30 days = $3^1/_3$ units each day and at the end of the month inventory will be zero.

The average number of units in stock will be EOQ/2. The average level of investment in this item will be the cash outlay required to acquire each unit (C) times the average number of units.

$$\text{Average investment} = (C \times EOQ)/2$$

If the cost per unit is ₹ 20, average investment in this item will be ₹ $(20 \times 100)/2$ = ₹ 1,000.

SAFETY STOCK OR MINIMUM INVENTORY LEVEL: Safety stock is the minimum level of inventory desired for an item given the expected usage rate and the expected time to receive an order. If an order is placed when the inventory reaches 150 units instead of 100 units, the additional 50 units constitute the safety stock. The firm expects to have fifty units in stock when the new order arrives. The safety stock protects the firm from stock-outs due to unanticipated demand for the item or to slow deliveries. Increasing the amount of inventory held as safety stock reduces the chances of a stock-out and therefore, reduces stock-out costs over the long run. The level of inventory investment is, however, increased by the amount of the safety stock.

The application of EOQ model presupposes the determination of minimum level or safety level for each item, that the firm must maintain. The safety level is ascertained and introduced as a part of inventory management because there is always an uncertainty involved with respect to the time lag, usage rate or any other factor. The assumption of certainty regarding time lag and usage rate may not hold good. Therefore, the firm may face a situation of stock-out even if utmost care has been taken. The safety stock is maintained in order to bail out the firm from any such situation.

The minimum level or safety level of an item is determined by the variability in demand for the item and the risk, the firm is willing to take of stock-outs. Usually, the smaller the safety level, the greater will be the risk of stock-outs. A firm can reduce the costs and risk of stock-outs by increasing the safety level. However, it may be noted that the safety level is usually fixed in advance whereas a stock-out may occur due to sudden increase or decrease in demand. Thus, the relationship between the safety level and the reduction of stock-outs is not linear.

The unexpected variations in both the time lag and the demand for the product affect the level of safety stock. The more certain are the patterns of movement of stock, the less is the safety stock required. If the stock movement is highly predictable, then there is a little chance of any stock out occurring. However, if the stock inflows and outflows are unpredictable, or lesser predictable, then it becomes necessary to carry additional safety stock to prevent unexpected stock outs. The best level of safety stock for a given item depends on how much a stock-out costs and on the variability

of usage rates and delivery times. If the usage rate and the delivery time can be forecasted with a high degree of accuracy and if the cost of a stock-out is estimated to be small, then little or no safety stock will be needed. If the circumstances are not so favourable, then a significant investment in safety stock will be desirable.

QUANTITY DISCOUNTS AND ORDER QUANTITY: The EOQ model, as given above, assumes that the purchase price per unit is fixed and constant irrespective of the number of units purchased by the firm. However, in practice, it is not so and very often, the seller offers a discount for purchase of a particular quantity. If so, then greater the order size, the lower will be the cost per unit. This affects, therefore, the applicability of the EOQ model. In order to over come this problem, it must be noted that a discount offers two types of savings to the firm. First, the saving on account of reduction of cost price, and second, saving in total ordering cost, as fewer orders will be placed as a result of higher quantity per order.

However, on the other hand, the total carrying cost of inventory will increase (as a result of higher EOQ). Thus, a quantity discount is worth taking only if the savings exceed the additional cost of holding stock. For this, the following procedure may be adopted:

1. Find out the EOQ, Q as usual as if there is no quantity discount available.
2. If this quantity, Q, is the quantity that helps the firm availing discount, then the 'Q' is the optimal order size.
3. If the 'Q' is less than the minimum quantity for availing discount, then the discount offer should be evaluated in terms of the total cost of maintaining inventory with and without discount. Example 16.3 explains this point.

Example 16.3

The following information is available in respect of the inventory costs of a firm:

Total annual consumption	=	600 units
Cost per unit	=	₹ 6
Order cost	=	₹ 10 per order
Carrying cost	=	20% of the value

Discount of 5% has been offered on an order of 200 units. Evaluate the discount offer.

Solution:

In this case, the EOQ is to be ascertained in the light of the parameters given. The carrying costs per annum is given at 20% of the value. So, the carrying costs, C, is 20% of ₹ 6 = ₹ 1.20. The economic order quantity can now be ascertained as follows:

$$EOQ = \sqrt{\frac{2AO}{C}}$$

or, $EOQ = [(2AO)/C]^{1/2}$

where, EOQ = Economic quantity per order.

A = 600

O = ₹ 10

C = ₹ 1.20

Now, $EOQ = [(2AO)/C]^{1/2}$

$= [(2 \times 600 \times 10)/1.20]^{1/2}$

= 100 units.

So, the EOQ is 100 units, but the quantity discount is available only if the quantity per order is at least 200 units. The evaluation of the discount offer can now be made in terms of the total cost with discount and without discount as follows:

		EOQ (without discount)	Quantity (with discount)
No. of units per order		100	200
No. of orders		6	3
Average inventory		50	100
Cost per unit (net)		₹ 6	₹ 5.70
Carrying cost of average inventory,	(A)	50 × 6 × 20% = ₹ 60	100 × 5.70 × 20% = ₹ 114
Total order costs	(B)	6 × 10 = ₹ 60	3 × 10 = ₹ 30
Cost of purchase	(C)	600 × ₹ 6 = ₹ 3,600	600 × ₹ 5.70 = ₹ 3,420
Total cost (A + B + C)		₹ 3,720	₹ 3,564

The total cost is expected to go down from ₹ 3,720 to ₹ 3,564 if the quantity discount is availed. Thus, the offer for discount may be availed by the firm.

POINTS TO REMEMBER

- Inventory includes and refers to raw material, work in progress and finished goods. Inventory management refers to management of level of these components.
- Inventory has costs and benefits associated with it. The costs of inventory include the cost of storage, cost of financing, cost of ordering and the cost of stock outs.
- The benefits of inventory are available in terms of independent production and sales activities.
- The inventory management involves a trade off between costs and benefits of inventory.
- In a systematic approach to inventory management, a financial manager has to identify (*i*) the items that are more important than others and (*ii*) the size of each order for different items.
- Two important techniques to deal with the inventory management are ABC Analysis and the Economic Order Quantity (EOQ) model.

- The EOQ model attempts to find out the number of units to be ordered every time in order to minimise the total cost of ordering and carrying the inventory.
- The EOQ may be adjusted to take care of the lag period, minimum inventory level and the quantity discount if offered by the supplier.

GRADED ILLUSTRATIONS

Illustration 16.1

The finance department of a Corporation provides the following information:

(*i*) The carrying costs per unit of inventory are ₹ 10.

(*ii*) The fixed costs per order are ₹ 20.

(*iii*) The number of units required is 30,000 per year.

Determine the economic order quantity (EOQ), total number of orders in a year and the time gap between two orders.

Solution:

The economic order quantity may be found as follows:

$$EOQ = \sqrt{\frac{2AO}{C}}$$

or, $EOQ = [(2AO)/C]^{1/2}$

where, EOQ = Economic quantity per order.

A = 30,000

O = ₹ 20

C = ₹ 10

Now, $EOQ = [(2AO)/C]^{1/2}$

$= [(2 \times 30{,}000 \times 20) \div 10]^{1/2}$

= 346 units.

So, the EOQ is 346 units and the number of orders in a year would be 30,000/346 = 86.7 or 87 orders. The time gap between two orders would be 365/87 = 4.2 or 4 days.

Illustration 16.2

XYZ & Company buys an item costing ₹ 125 each in lots of 500 boxes which is a 3 month supply and the ordering cost is ₹ 150. The inventory carrying cost is estimated at 20% of unit value. What is the total annual cost of the existing inventory policy? How much money could be saved by employing the economic order quantity?

Solution:

The existing cost of maintaining inventory is as follows:

Since, the firm is buying 500 units which are sufficient for 3 months supply, it means that the firm is placing 4 orders in a year, and the average inventory is 250 units (*i.e.*, 500/2). Now,

Ordering cost (4 × 150)	₹ 600
Carrying cost (125 × 250 × 20%)	6,250
Total annual cost of existing policy	6,850

The economic order quantity may be ascertained as follows:

$$EOQ = \sqrt{\frac{2AO}{C}}$$

or, $EOQ = [(2AO)/C]^{1/2}$

where, EOQ = Economic quantity per order.

A = 500 × 4 = 2,000 units

O = ₹ 150

C = 20% of ₹ 125 = 25

Now, $EOQ = [(2AO)/C]^{1/2}$

$= [(2 \times 2{,}000 \times 150)/25]^{1/2}$

= 155 units.

So, the EOQ is 155 units and the number of orders in a year would be 2,000/155 = 12.9 or 13, and the average inventory would be 155/2 = 77.5 units. The cost of maintaining this economic order quantity is as follows:

Ordering cost (13 × l50)	₹ 1,950
Carrying cost (125 × 77.5 × 20%)	1,937
Total annual cost of existing policy	3,887

So, the firm can save in annual cost of maintaining inventory to the extent of ₹ 6,850 – 3,887 = ₹ 2,863.

Illustration 16.3

ABC Motors purchases 9,000 units of spare parts for its annual requirements, ordering one month usage at a time. Each spare part costs ₹ 20. The ordering cost per order is ₹ 15 and the carrying charges are 15% of unit cost. You have been asked to suggest a more economical purchasing policy for the company. What advice would you offer, and how much would it save the company per year? *[B.Com.(H.), D.U. 2014]*

Solution:

The existing cost of maintaining inventory is as follows:

Since, the firm is buying 9,000 units which are purchased in orders of 1 month usage, therefore, the number of units being ordered per order is 9,000/12 = 750 units, and the firm is placing 12 orders in a year, and the average inventory is 375 units (*i.e.*,750/2). Now,

Ordering cost (12 × ₹ 15)	₹ 180
Carrying cost (20 × 375 × 15%)	1,125
Total annual cost of existing policy	1,305

The economic order quantity may be ascertained as follows:

$$EOQ = \sqrt{\frac{2AO}{C}}$$

Or, $EOQ = [(2AO)/C]^{½}$

where, EOQ = Economic quantity per order.

A = 9,000 units
O = ₹ 15
C = 15% of ₹ 20 = ₹ 3
Now, EOQ = $[(2AO)/C]^{½}$
= $[(2 \times 9,000 \times 15)/3]^{½}$
= 300 units.

So, the EOQ is 300 units and the number of orders in a year would be 9,000/300 = 30, and the average inventory would be 300/2 = 150 units. The cost of maintaining this economic order quantity is as follows:

Ordering cost (30 × 15)	₹ 450
Carrying cost (20 × 150 × 3)	450
Total annual cost of existing policy	900

So, the firm can save in annual cost of maintaining inventory to the extent of ₹ 1,305–900 = ₹ 405.

Illustration 16.4

PQR & Co. buys 1,00,000 units of material X every month to supply steady demand for the material in production. Order costs are ₹ 200 per order and the carrying costs are 10 paise per unit per month.

Find out economic quantity. Should PQR & Co. accepts a quantity discount of 2 paise per unit for materials X if it buys in lots of 50,000 units?

Solution:

The economic order quantity may be ascertained as follows:

EOQ = $\sqrt{\frac{2AO}{C}}$

or, EOQ = $[(2AO)/C]^{1/2}$

where, EOQ = Economic quantity per order.
A = 1,00,000 × 12 = 12,00,000 units
O = ₹ 200
C = ₹ 0.10 × 12 = 1.20
Now, EOQ = $[(2AO)/C]^{½}$
= $[(2 \times 12,00,000 \times 200)/1.20]^{½}$
= 20,000 units.

So, the EOQ is 20,000 units and the number of orders in a year would be (12,00,000/20,000) = 60 and the average inventory would be 20,000/2 = 10,000 units. The discount offer may be evaluated as follows:

The total annual cost of maintaining 20,000 (EOQ) units:

Ordering cost (200 × 60)	₹ 12,000
Carrying cost (1.20 × 10,000)	12,000
Total annual cost of existing policy	24,000

The total annual cost of maintaining 50,000 (Discount offer) units:

In this case, the number of orders would be 12,00,000/50,000 = 24 and average stock would be 25,000 (*i.e.*, 50,000/2).

Ordering cost (200 × 24)	₹ 4,800
Carrying cost (1.20 × 25,000)	30,000
Total annual cost of existing policy	34,800
–Discount (12,00,000 × .02)	24,000
Net cost of discount offer	10,800

So, the firm can save in annual cost of maintaining inventory to the extent of ₹ 24,000 – 10,800 = ₹ 13,200 by accepting the discount offer.

Illustration 16.5

A company manufactures a product from a raw material, which is purchased at ₹ 60 per kg. The company incurs a handling cost of ₹ 360 *plus* freight of ₹ 390 per order. The incremental carrying cost of inventory of raw material is ₹ 0.50 per kg. per month. In addition, the cost of working capital finance on the investment in inventory of raw material is ₹ 9 per kg. per annum. The annual production of the product is 1,00,000 units and 2.5 units are obtained from 1 kg. of raw material.

Required :

(*i*) Calculate the economic order quantity of raw material.

(*ii*) Advice, how frequently should orders for procurement of raw material be placed, assuming 360 days in a year.

(*iii*) If the company proposes to rationalise placement of orders on quarterly basis, what percentage of discount in the price of raw material should be negotiated.

[B.Com. (H.) D.U., 2010]

Solution :

Cost per kg.	₹ 60
Handling Cost per order	₹ 360
Freight per order	₹ 390
Total cost per order	₹ 750
Carrying Cost per annum (.50 × 12)	₹ 6
WC Finance cost per Kg.	₹ 9
Total carrying cost per kg.	₹ 15
Annual Production (Units)	1,00,000
Annual Requirement in Kg. (10,000 ÷ 2.5)	40,000

$$EOQ = \sqrt{\frac{2AO}{C}} = \sqrt{\frac{2 \times 40,000 \times 750}{15}}$$

= 200 Units

No. of orders per annum = 20

Frequency or orders (360 ÷ 20) = 18 days

Discount to be negotiated:

	EOQ Orders	Quarterly Orders
No. of Orders	20	4
Total Order Cost @ ₹ 750 each	₹ 15,000	₹ 3,000
Units per Order	2000	10,000
Average Inventory (Units)	1000	5,000
Carrying Cost per annum per unit	15	15

	EOQ Orders	Quarterly Orders
Total annual carrying Cost (₹)	15,000	75,000
Order Cost + Carrying Cost (₹)	30,000	78,000
Increase in Cost (₹)		48,000
Total Cost of Purchase (₹)(60 × 40,000)		24,00,000
% Discount required (48,000 ÷ 24,00,000)		2%

So, the firm should negotiate to get at least 2% discount on all purchases if it wants to place quarterly orders in place of EOQ orders.

Illustration 16.6

ABC & Co. buys and uses a component for production at ₹ 10 per unit. The annual requirement is 2,000 numbers. Carrying cost of inventory is 10% per annum, and ordering cost is ₹ 40 per order. The purchase manager argues that as the ordering cost is high, it is advantageous to place a single order for the entire annual requirement. He also says that if the order is 2,000 units at a time, there is a 3% discount from the supplier. Evaluate this proposal and make your recommendation.

Solution:

The economic order quantity may be ascertained as follows:

$$EOQ = \sqrt{\frac{2AO}{C}}$$

or, $EOQ = [(2AO)/C]^{1/2}$

where, EOQ = Economic quantity per order.

A = 2,000 units

O = ₹ 40

C = ₹ 1

Now, $EOQ = [(2AO)/C]^{1/2}$

$= [(2 \times 2{,}000 \times 4)/1]^{1/2}$

= 400 units.

So, the EOQ is 400 units and the number of orders in a year would be 2,000/400 = 5.

EVALUATION OF THE PROPOSAL FOR SINGLE ORDER

	Single order	Orders based on EOQ
Size of order (units)	2,000	400
Number of orders	1	5
Cost per order	₹ 40	₹ 40
Total ordering cost (A)	₹ 40	₹ 200
Carrying cost per unit	₹ 1	₹ 1
Average inventory (size of order ÷ 2)	1,000	200
Total carrying cost (B)	1,000	200
Savings in form of 3% discount on aggregate purchases under single order (2,000 × ₹ 10 × 3%) (C)	(600)	—
Total cost (A + B – C)	₹ 440	400

Since, the total cost is less when ordering for EOQ, therefore, the benefit of 3% discount factor on purchases does not fully set off the increase in order cost and carrying cost per unit. Therefore, the firm should place the order only for 400 units at a time.

Illustration 16.7

The Purchase Manager of an organization has collected the following data for one of the A class items.

Interest on the locked up capital	20%
Order processing cost for each order	₹ 100
Inspection cost per lot	₹ 50
Follow up cost for each order	₹ 80
Pilferage while holding inventory	5%
Other holding cost	15%
Other procurement cost for each order	₹ 170
Annual demand	1,000 units
Cost per item	₹ 10
Discount for a minimum order quantity of 500 items is	10%

What should be the ordering policy of the Purchase Manager?

Solution:

The total inventory carrying cost (20% + 5% + 15%)	40%
Ordering cost, O, (100 + 50 + 80 + 170)	₹ 400

The economic order quantity may be ascertained as follows:

$$EOQ = \sqrt{\frac{2AO}{C}}$$

or, $EOQ = [(2AO)/C]^{1/2}$

where, EOQ = Economic quantity per order.

A = 1,000 units

O = ₹ 400

C = ₹ 4

Now, $EOQ = [(2AO)/C]^{1/2}$

$= [(2 \times 1{,}000 \times 400)/4]^{1/2}$

= 447 units.

So, the EOQ is 447 units and the number of orders in a year would be 1,000/447 = 2.24 or 3 orders. If the firm is going to place 3 orders, then instead of 447 units, the firm may place order for 334 units (1,000/3) only. The discount offer under different positions may be evaluated as follows:

	Order of 500 units	Orders based on EOQ	Order of 334 units
Size of order (units)	500	447	334
Number of orders	2	3	3
Cost per order	₹ 400	₹ 400	₹ 400
Total ordering cost (A)	₹ 800	₹ 1,200	₹ 1,200
Carrying cost per unit	₹ 3.60	₹ 4	₹ 4
Average inventory (size of order ÷ 2)	250	224	167
Total carrying cost (B)	900	896	668
Total purchase cost (1,000 units @ ₹ 9/10) (C)	9,000	10,000	10,000
Total cost (A + B + C)	₹ 10,700	₹ 12,096	₹ 11,868

Since, the total cost is less when ordering is 500 units, therefore, the benefit of 10% discount on purchases is fully justified.

Illustration 16.8

A manufacturing company purchases 24,000 pieces of a component from a sub-contractor at ₹ 500 per piece and uses them in assembly department, at a steady rate. The cost of placing an order and following it up is ₹ 2,500. The estimated stock-holding cost is approximately 1% of the value of average stock held. The company is placing orders which at present vary between an order placed every two months. (*i.e.,* six orders p.a.) to one order per annum. Which policy would you recommend ? *[B.Com. (H.), D.U., 2012]*

Solution :

In this case, the company is presently placing from 6 orders to 1 order per annum. These different policies can be evaluated as follows :

	Number of Orders per annum					
Orders per annum	6	5	4	3	2	1
Annual Requirement (nos.)	24,000	24,000	24,000	24,000	24,000	24,000
Order Size (nos.)	4,000	4,800	6,000	8,000	12,000	24,000
Total Order Cost @ ₹ 2500	15,000	12,500	10,000	7,500	5,000	2,500
Average Inventory (nos.)	2,000	2,400	3,000	4,000	6,000	12,000
Annual Carrying Cost (Av. Q × .01 × ₹ 500) (₹)	10,000	12,000	15,000	20,000	30,000	60,000
Total Annual Cost (₹)	25,000	24,500	25,000	27,500	35,000	62,500

As the total annual cost (carrying cost + ordering cost) is least in case of 5 orders per annum, the firm should follow a policy of placing 5 orders per annum.

Illustration 16.9

XYZ & Co. maintains several items of inventory. The average number of each of these as well as their unit costs is listed below:

Item	Average inventory (units)	Average cost per units (₹)	Item	Average inventory (units)	Average cost per units (₹)
1	4,000	1.96	11	1,800	25.00
2	200	10.00	12	130	2.70
3	440	2.40	13	4,400	9.50
4	2,000	16.80	14	3,200	2.60
5	20	165.00	15	1,920	2.00
6	800	6.00	16	800	1.20
7	160	76.00	17	3,400	2.20
8	3,000	3.00	18	2,400	10.00
9	1,200	1.90	19	120	21.00
10	6,000	0.50	20	320	4.00

The firm wishes to adopt an ABC inventory system. How should the items be classified into A, B and C?

Solution:

Ranking and classification of items according to usage value:

Item	Units	% of total	Unit cost	Total cost	% of total	Classification
11	1,800	5.02	₹ 2.5	₹ 45,000	21.27	A
13	4,400	12.30	9.5	41,800	19.75	A
4	2,000	5.58	16.8	33,600	15.88	A
18	2,400	6.70	10.0	24,000	11.34	A
7	160	0.45	76.0	12,160	5.75	B
8	3,000	8.37	3.0	9,000	4.25	B
14	3,200	8.94	2.6	8,320	3.93	B
1	4,000	11.17	1.96	7,840	3.71	B
17	3,400	9.49	2.20	7,480	3.53	B
15	1,920	5.36	2.00	3,840	1.81	C
5	20	0.06	165.00	3,300	1.56	C
10	6,000	16.76	0.50	3,000	1.42	C
19	120	0.34	21.00	2,520	1.19	C
9	1,200	3.35	1.90	2,280	1.08	C

Item	Units	% of total	Unit cost	Total cost	% of total	Classification
2	200	0.56	10.00	2,000	0.94	C
6	300	0.84	6.00	1,800	0.85	C
20	320	0.89	4.00	1,280	0.60	C
3	440	1.23	2.40	1,056	0.50	C
16	800	2.23	1.20	960	0.45	C
12	130	0.36	2.70	351	0.16	C
		100.00			100.00	

The total value of items classified as group A is 68.24% (*i.e.*, 21.27 + 19.75 + 15.88 + 11.34%), group B is 21.27% (*i.e.*, 5.75 + 4.25 + 3.93 + 3.71 + 3.53), and group C is 10.49% (*i.e.*, 1.81 + 1.56 + 1.42 + 1.19 + 1.08 + 0.94 + 0.85 + 0.60 + 0.50 + 0.45 + 0.16).

OBJECTIVE TYPE QUESTIONS

State whether each of the following statements is ***True (T)*** *or* ***False (F).***

(*i*) Inventory management does not include management of work in progress.

(*ii*) Stock of finished goods should be as high as possible so that no customer is denied the sale.

(*iii*) There is no explicit benefit of keeping inventory, hence no stock be maintained.

(*iv*) Carrying cost of inventory includes the carriage in.

(*v*) Carrying cost and ordering cost are opposite forces in receivable management.

(*vi*) Cost of stock out occurs whenever the firm has no stock of a particular item.

(*vii*) ABC analysis helps to ascertain the minimum level of stock of raw material.

(*viii*) The EOQ model attempts to minimizing the total cost of holding inventory.

(*ix*) EOQ model assumes a constant usage rate for a particular item.

(*x*) Average inventory in EOQ model is 1/2 of EOQ.

[**Answers:** *(i) F, (ii) F, (iii) F, (iv) F, (v) T, (vi) F, (vii) F, (viii) T (ix) T, (x) T.*]

MULTIPLE CHOICE QUESTIONS

1. EOQ is the quantity that minimizes :
- (*a*) Total Ordering Cost,
- (*b*) Total Inventory Cost,
- (*c*) Total Interest Cost,
- (*d*) Safety Stock Level.

2. ABC Analysis is used in :
- (*a*) Inventory Management,
- (*b*) Receivables Management,
- (*c*) Accounting Policies,
- (*d*) Corporate Governance.

3. If no information is available, the General Rule for valuation of stock for balance sheet is :
- (*a*) Replacement Cost,
- (*b*) Realizable Value,
- (*c*) Historical Cost,
- (*d*) Standard Cost.

4. In ABC inventory management system, class A items may require :
- (*a*) Higher Safety Stock,
- (*b*) Frequent Deliveries,
- (*c*) Periodic Inventory system,
- (*d*) Updating of inventory records.

5. Inventory holding cost may include :
- (*a*) Material Purchase Cost,
- (*b*) Penalty charge for default,
- (*c*) Interest on loan,
- (*d*) None of the above.

6. Use of safety stock by a firm would :
- (*a*) Increase Inventory Cost,
- (*b*) Decrease Inventory Cost,
- (*c*) No effect on cost,
- (*d*) None of the above.

7. Which of the following is true for a company which uses continuous review inventory system :
- (*a*) Order Interval is fixed,
- (*b*) Order Interval varies,
- (*c*) Order Quantity is fixed,
- (*d*) Both (*a*) and (*c*).

8. In the EOQ Model :
- (*a*) EOQ will increase if order cost increases,
- (*b*) EOQ will decrease if holding cost decreases,
- (*c*) EOQ will decrease if annual usage increases,
- (*d*) None of the above.

9. EOQ determines the order size when :
   (*a*) Total Order cost is Minimum,
   (*b*) Total Number of order is least,
   (*c*) Total inventory costs are minimum,
   (*d*) None of the above.
10. ABC Analysis is useful for analyzing the inventories :
   (*a*) Based on their Quality,
   (*b*) Based on their Usage and value,
   (*c*) Based on Physical Volume,
   (*d*) All of the above.
11. If A = Annual Requirement, O = Order Cost and C = Carrying Cost per unit per annum, then EOQ is :
   (*a*) $(2AO/C),^2$
   (*b*) $\sqrt{2\,AO/C}$,
   (*c*) $2A \div OC$,
   (*d*) 2 AOC.
12. Inventory is generally valued as lower of :
   (*a*) Market Price and Replacement Cost,
   (*b*) Cost and Net Realizable Value,
   (*c*) Cost and Sales Value,
   (*d*) Sales Value and Profit.
13. Which of the following is not included in cost of inventory?
   (*a*) Purchase cost,
   (*b*) Transport in Cost,
   (*c*) Import Duty,
   (*d*) Selling Costs.
14. Cost of not carrying sufficient inventory is known as :
   (*a*) Carrying Cost,
   (*b*) Holding Cost,
   (*c*) Total Cost,
   (*d*) Stock-out Cost
15. Which of the following is not a benefit of carrying inventories?
   (*a*) Reduction in ordering cost,
   (*b*) Avoiding lost sales,
   (*c*) Reducing carrying cost,
   (*d*) Avoiding Production Shortages.
16. Which of the following is not a standard method of inventory valuation?
   (*a*) First in First out,
   (*b*) Standard Cost,
   (*c*) Average Pricing,
   (*d*) Realizable Value.
17. System of procuring goods when required, is known as :
   (*a*) Free on Board (FOB),
   (*b*) Always Better Control (ABC),
   (*c*) Just in Time (JIT),
   (*d*) Economic Order Quantity.
18. A firm has inventory turnover of 6 and cost of goods sold is ₹ 7,50,000. With better inventory management, the inventory turnover is increased to 10. This would result in :
   (*a*) Increase in inventory by ₹ 50,000,
   (*b*) Decrease in inventory by ₹ 50,000,
   (*c*) Decrease in cost of goods sold,
   (*d*) Increase in cost of goods sold.
19. What is Economic Order Quantity?
   (*a*) Cost of an Order,
   (*b*) Cost of Stock,
   (*c*) Reorder level,
   (*d*) Optimum order size.

[**Answers :** *1. (a), 2. (a), 3. (c), 4. (a), 5. (d), 6. (a), 7. (b), 8. (a), 9. (c), 10. (b), 11. (b), 12. (b), 13. (d), 14. (d), 15. (c), 16. (c), 17. (c), 18. (b), 19. (d)*]

ASSIGNMENTS

1. Write short notes on:
   - ABC Analysis of inventory control.
   - Economic order quantity.
   - Stock-out. *[B.Com.(H.), D.U. 2013]*
   - Costs associated with inventory management. *[B.Com.(H.), D.U. 2015]*
2. What is the need for holding inventory? Why inventory management is important?
3. What are the costs and benefits associated with inventory? Explain.
4. What are the objectives of inventory management? How are they similar to objectives of cash management?
5. What are the considerations governing the maximum and minimum level of inventory?
6. Explain briefly some of the techniques of inventory management, that may be used in a manufacturing concern.
7. What are various costs which affect EOQ ? *[B.Com.(H.), D.U. 2007]*
8. Define safety stock. How is it determined? What is the role of safety stock in inventory management?
9. What do you mean by stock-out? Explain the trade-off between stock out and carrying costs of inventory. *[B.Com.(H.), D.U. 2014]*
10. Explain the EOQ model of inventory control. What are its shortcomings? *[B.Com.(H.), D.U., 2018]*
11. Discuss ABC system of inventory management. *[B.Com.(H.), D.U. 2011]*

PROBLEMS

P16.1 A purchase manager places order, each time for a lot of 500 numbers of a particular item. From the available data, the following results are obtained:

Inventory Carrying Cost	40%
Ordering cost per order	₹ 600
Cost per unit	₹ 50
Annual demand	1,000 units

Find out the loss of the organization due to his ordering policy.

[*Answer:* The loss is ₹ 1,300. EOQ is 250 units.]

P16.2 A materials manager has the following data for procuring a particular item. Annual Demand = 1,000. Ordering cost = ₹ 800. Inventory carrying cost = 40%. Cost per item = ₹ 60. If the order quantity is more than or equal to 300, a discount of 10% is given. For how much should he place the order in order to minimize total variable cost?

[*Answer:* EOQ is 258 units (without discount) and 272 units (with discount). As the discount is available only for order of 300 units, the total variable costs should be compared. The total variable cost of EOQ is ₹ 66,296 and of 300 units order is ₹ 60,440. So, order of 300 units may be placed.]

P16.3 A company is considering the possibility of purchasing from a supplier a component it now makes. The supplier will provide the components in the necessary quantities at a unit price of ₹ 9. Transportation and storage costs would be negligible. The company produces the component from a single raw material in economic lots of 2,000 units at a cost of ₹ 2 per unit. Average annual demand is 20,000 units. The annual holding cost is ₹ 0.25 per unit and the minimum stock level is set at 400 units. Direct labour costs for the components are ₹ 6 per unit, fixed manufacturing overhead is charged at a rate of ₹ 3 per unit based on a normal activity of 20,000 units. The company also hires the machine on which the components are produced at a rate of ₹ 200 per month. Should the firm make or buy the component?

[*Answer:* EOQ, Carrying cost and annual requirements are given at 2,000 units, ₹ 0.25 per unit and 20,000 units respectively. So, applying the EOQ model, the ordering cost comes to ₹ 25 per order. Average stock is 400 + 1/2 EOQ = 1,400 units. For average holding of 1,400 units, the total annual cost of producing 20,000 units is ₹ 1,63,000. The company should make the component as the cost of production is less than cost of purchasing.]

P16.4 A publishing house purchases 2,000 units of a particular item per annum at a unit cost of ₹ 20, ordering cost per order is ₹ 50 and the inventory carrying cost is 25%. Find the optimal order quantity and the minimum total cost including the purchase cost. If 3% discount is offered by the supplier for purchase in lots of 1,000 or more, should the publishing house accept the proposal?

[*Answer:* EOQ = 200 units and total annual cost is ₹ 41,000. At 3% discount, the total annual cost is ₹ 41,325.] *[B.Com.(H.) D.U. 2009]*

P16.5 Your factory buys and uses a component for production @ ₹ 10 per piece. Annual requirement is 2,000 pieces. Carrying cost of inventory is 10% per annum and ordering cost is ₹ 40 per order. The purchase manager suggests that as the ordering cost is very high, it is advantages to place a single order for the entire annual requirement. He also suggest that if 2,000 pieces are ordered at a time, the factory can get a 3% discount from the supplier. Evaluate this proposal in a tabular format and make your recommendation.

[*Answer:* The least cost comes when orders are placed for 400 unit. At one order of 2,000 units, the total cost (after discount) is ₹ 20,410.]

P16.6 Draw the ABC curve for the data given below:

Item No.	Quantity consumed in a year	Cost per unit (₹)
1	2	40
2	200	5
3	30	1,000
4	20	20
5	4	20
6	16	2,000
7	24	50
8	5	40
9	100	8
10	250	4
11	120	8
12	140	7
13	10	10
14	20	10
15	200	5

[*Answer:* Category A includes items 6 and 3; item numbers 7, 2, 10, 15, 11, 12 and 9 are in category B and others are in category C.]

PART VI

VALUATION

Valuation is one of the fundamental concepts in Financial Management. A financial analysts is often required to value the assets of the firms, the shares or other securities of the company or the total firm itself. In case of mergers and acquisitions, the valuation of asset is required, whereas in case of investment management, valuation of securities is required. There are several concepts of valuation, however, in financial management, the capitalised value or economic value concept is used. The value of a share or intrinsic value of a share is defined as the present value of all future benefits expected by the shareholders from the company. These benefits may be in the form of dividends, bonus shares, right shares, warrants, etc.

Part VI deals with valuation of securities and contains one chapter. Keeping in view the target readership, limited overview of the basic valuation model and valuation of specific securities has been given. The learning objectives are:

- *What is valuation and what are different concepts of valuation?*
- *How to obtain valuation of equity shares under different set of assumptions?*
- *How to use basic valuation model for the valuation of fixed charge securities?*

CONTENTS

CHAPTER 17 VALUATION OF SECURITIES

CHAPTER

17

Valuation of Securities

"Intuitively, the value of any assets should be a function of three variables: (i) How much it generates in Cash flows; (ii) When these Cash flows are expected to occur; and (iii) The uncertainty associated with these Cash flows. Discounted Cash flows valuation brings these three variables together by computing the value of any asset to be the present value of its expected future Cash flows."[1]

SYNOPSIS

- Concept of Valuation.
- The Required Rate of Return.
- Basic Valuation Model.
- Bond Valuation.
  - Bond Valuation Behaviour.
  - Yield to Maturity.
  - Interaction between Bond Value and Interest Rate Risk.
  - Valuation of Convertible Debentures.
  - Valuation of Deep Discount Bonds.
- Valuation of Preference Shares.
  - Redeemable Preference Share.
  - Irredeemable Preference Share.
- Valuation of Equity Shares.
  - Valuation based on Accounting Information.
  - Valuation based on Dividends.
  - Valuation based on Earnings.
- Graded Illustrations in Valuation.

1. Damodaran, A., *Corporate Finance*, John Wiley & Sons Inc., New York, 1997, p. 618.

The objective of the financial management has been defined as the maximization of shareholders wealth as reflected in the market price of the share. It is no denying the fact that the market price of a share is often unpredictable and subject to the nature and proper functioning of the capital market. If the market price of the share is not available (in case of unlisted companies) or not reliable then the question is: how to value these securities? An investor needs a basic understanding of the theoretical framework for the valuation of securities. This theoretical framework is based on the concept of TVM, which is already discussed in Chapter 2, and the risk-return dimension. The valuation of the shares and also the valuation of the bonds and the debentures is of utmost importance to any finance manager. This chapter throws light on the concepts and procedures of valuation of shares and bonds, the two important financial assets with which an investor has often to deal with. In order to discuss the valuation of securities, the concept of valuation in general, also needs to be taken up.

CONCEPT OF VALUATION

Valuation is the process of determining the worth of an assets. Any assets, physical or financial, has a value to the extent that it can satisfy desires, needs or wants of the holder. The physical assets refer to the tangible assets such as land, building, stock, furniture, etc. The financial assets refer to the financial claims such as bonds, preference share and equity share etc. In this chapter, the valuation of only financial assets has been discussed. So, the process of estimating the value of these financial asset is called valuation for the purpose of this chapter. Every investor and finance manager must understand how to value the financial assets to judge whether these are a good buy or not.

A number of concepts of valuation have been used in the literature. These different concepts of valuation discussed here, have specific uses and purposes and therefore the same assets may be valued differently by different person with different perspective.

1. **Book Value (BV) :** The BV of an assets is an accounting concept based on the historical data given in the balance sheet of the firm. The BV of an assets may either be given in the balance sheet or can be ascertained on the basis of figures contained, in the balance sheet. For example, the BV of a debenture is the face value itself and is stated in the balance sheet. The BV of an equity share can be ascertained by dividing the net worth of the firm by the number of equity shares.
2. **Market Value (MV) :** The MV of an assets is defined as the price for which the asset can be sold. The MV of a financial asset refers to the price prevailing at the stock exchange. In case a security is not listed, then its MV may not be available. However, the MV of physical assets such as plant or furniture etc. may be difficult to be ascertained, unless the owner is ready to dispose it off.
3. **Going Concern Value (GV) :** The GV refers to the value of the business as an operating, performing and running business unit. This is the value which a prospective buyer of a business may be ready to pay. The GV is not necessarily the MV/BV of all the assets taken together. GV may be less than or more than the MV/BV of the total business. Rather, GV depends upon the ability to generate sales and profits in future. If the GV is higher than the MV, then the difference between the two represents the synergies of combined assets.
4. **Liquidating Value (LV) :** The LV refers to the net realizable value and is equal to the difference between the value of all assets and the sum total of external liabilities. This net difference belongs to the owners/shareholders and is known as the LV. The LV is a factor of realizable value of asset and therefore is uncertain. The LV may be zero also and in such a case the owners/shareholders do not get anything if the firm is dissolved.
5. **Capitalized Value (CV) :** The CV of a financial assets is defined as the sum of present value of cash flows from an asset. In order to find out the CV, the future expected benefits are discounted for time value of money. In the valuation of financial assets, the CV is the most relevant concept of valuation and has been used throughout this chapter. The CV is also known as **Economic Value.** The suitability of CV as a method of valuation of financial assets can be substantiated in terms of the following:

   (*a*) ***Cash flows :*** The value of an asset is contained in its ability to produce cash flows over a given period of time interval. The financial assets represent a claim in future in terms of interests or dividends receivable or in terms of maturity/sales price. Since the financial assets produce these cash flows, therefore the value of such assets should be based upon these future cash flows. A financial assets may provide a single future cash flows (*e.g.*, the Deep Discount bonds) or may generate a series of cash flows (*e.g.*, debentures or shares).

   (*b*) ***Timing :*** Since the cash flows may occur over a period of time, the value of a financial assets should consider the time value of money also. In general, the sooner the cash flows are the higher is its present value. The cash flows together with time value of money defines the return from the financial asset. Thus, the financial assets are valued by computing present values of their future cash flows.

   (*c*) ***The risk :*** The holder of a financial assets will also like to consider the risk associated with a security and its cash flows. The risk associated with a particular cash flows affects the present value of the cash flows and hence the present value of the assets. The risk associated with a cashflow can be incorporated in the valuation process by using a proper discount rate.

REQUIRED RATE OF RETURN

The application of the concept of CV requires in the first instance, the determination of the discount rate or the required rate of return of the investors for a specific security being valued. This required rate of return may be defined as the minimum rate of return necessary to induce an investor

to hold or to buy the security. This minimum required rate of return is consisting of two parts *i.e.*, the risk-free rate (which is equal for all the securities) and the risk premium (which depends upon the risk associated with a security). This can be stated as follows:

$$k = I_f + r_p \qquad (17.1)$$

where, I_f = risk-free rate, and

r_p = risk-premium

k = The required rate of return.

Equation 17.1 has been presented graphically in Figure 17.1

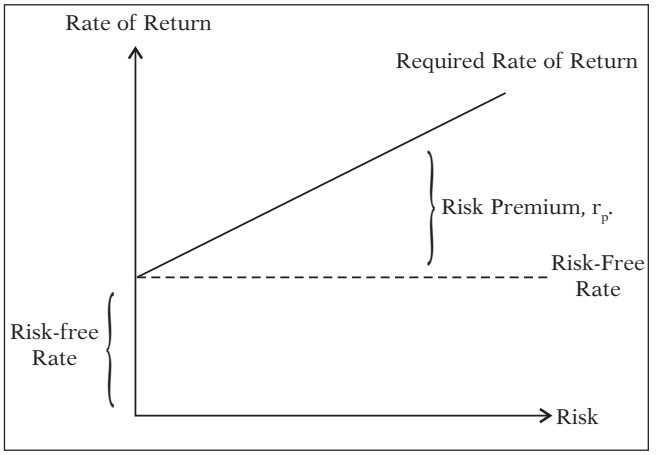

FIGURE 17.1: THE REQUIRED RATE OF RETURN AND ITS COMPONENTS

The level of risk associated with a given cashflow can significantly affect its value. In terms of present value, greater risk is incorporated by using a higher discount rate/rate of return. Figure 6.1 shows that as the risk increases, the required rate of return also increases and the increase occurs because of the increase in risk premium. The risk free rate, I_f, remains same for all levels of risk, and the risk premium, r_p, goes on increasing with the increase in risk.

Thus, it may be said that the required rate of return is a factor of the following:

1. The risk-free rate, I_f,
2. The risk perception/attitude of the investors, and
3. The risk premium r_p *i.e.*, compensation required for bearing the risk.

BASIC VALUATION MODEL

It is already stated that the CV of a financial assets is the present value of all future cash flows expected over the relevant period. For this purpose, the risk return perspective is also to be incorporated. Different investors have different priorities of risk and return. Therefore, in order to develop a general model of valuation, the following are some of the assumptions to be made :

1. That the cash flows or the returns are estimated or forecasted as a point estimate rather than a probability distribution. The implication of this assumption is that the future cash flows are represented by a single figure and not a series of expected figures. How these estimated figures are generated depends upon the type of financial assets being valuated.
2. That every investor has a subjective assessment of the risk associated with a financial assets and its expected cash flows, and he incorporates this risk in the valuation procedure through the discount factor. Therefore, the discount factor appropriate for one investor may not be good enough for another investor. Any investor is also subjective with reference to the risk associated with different securities at a point of time. Same investor may perceive one security to be more risky than another. The implication is that no standard rate of discount can be applied to all the investors and/or all the securities. The higher the risk, greater would be the discount factor.

THE MODEL : Basically, the value of a financial asset is to be ascertained by a direct application of the concept of the time value of money (already discussed in Chapter 2). The value of a financial asset is determined by discounting the expected cash flows to their present value, at a discount rate commensurate with the risk return perspective of the investor. So, utilizing the present value technique, the value of a financial asset can be expressed as follows:

$$V_0 = \frac{CF}{(1+k)^1} + \frac{CF}{(1+k)^2} + \frac{CF}{(1+k)^n} \qquad (17.2)$$

where, V_0 = Value of the security at present,

CF_i = Cash Flows expected at the end of year i,

k = Appropriate discount rate and

n = Expected life of the assets.

Equation 17.2 can also be written as:

$$V_0 = \sum_{i=1}^{n} \frac{CF_i}{(1+k)^i}$$

The value of a financial asset is the sum of discounted values of future cash flows. So, given the series of cash flows over the relevant period, the appropriate discount rate can be used to find out the value of the asset. For example, an investment is expected to provide an annual cash inflow of ₹ 5,000 p.a. for next 5 years and the appropriate discount rate for the risk associated with this investment is 15%, the value of the investment may be found as follows:

$$V_0 = \sum_{i=1}^{n} \frac{5000}{(1+.15)^i}$$

After going through the basic valuation model, the next step is to understand the valuation of two basic financial assets *i.e.*, the bonds and the shares.

BOND VALUATION

A bond or a debenture is a debt security issued by a borrower and subscribed/purchased by a lender/investor. Bond is a usual form of long term financing used by firms which upon issuing a bond, promise to make certain cash flows in future (in the form of interest and/or repayment) under clearly

defined terms and conditions. In order to understand the valuation of bonds, the understanding of the following basic terms is required :

(*i*) ***Par Value :*** The par value (also called face value or nominal value) of a bond is the principal amount of a bond and is stated on the face of the bond security. The par value of a bond may be ₹ 100, ₹ 1,000 or any amount. The issue price, however, may be less than, equal to or more than the par value. Similarly, the redemption repayment may also be less than, equal to or more than the par value.

(*ii*) ***Coupon Rate :*** This is the rate at which interest on the par value of the bond is payable as per the payment schedule. The interest may be paid annually, semi- annually or even monthly. The coupon rate is usually described as % rate and is applied to the par value to find out the periodic interest amount.

(*iii*) ***Maturity :*** The maturity of a bond refers to the period from the date of issue, after the expiry of which the redemption repayment will be made to the investor by the borrower firm.

Assumption : An assumption which may be required while valuing a bond is that the first interest payment shall become due for payment after one year from the date of purchase/ issue of the bond.

Valuation Model : The value of a bond may be defined as the sum of the present values of the future interest payments *plus* the present value of the redemption repayment. The appropriate discount rate to find out the present value would be the required rate of return k_d, which depends upon the prevailing risk free interest rate and the risk premium. Equation 17.2 of the basic valuation model may be modified to find out the value of a bond as follows :

$$B_0 = \sum_{i=1}^{n} \frac{I_i}{(1+k_d)^i} + \frac{RV}{(1+k_d)^n} \qquad (17.3)$$

where, B_0 = A value of bond at present,

I_i = Annual interest payment starting one year from now till the end of year n,

RV = Redemption repayment at the end of year n, and

k_d = Appropriate discount rate.

Example 17.1

A bond of ₹ 1,000 bearing a coupon rate of 12% is redeemable at par in 10 years. Find out the value of the bond if:

(*i*) Required rate of return is 12% or 10% or 14%.

(*ii*) Required rate of return is 14% and the maturity period is 8 years or 12 years.

(*iii*) Required rate of return is 12% and redeemable at ₹ 950 or at ₹ 1,050 after 10 years.

Solution :

The value of the bond can be ascertained by the Equation 17.3 as follows:

$$B_0 = \sum_{i=1}^{n} \frac{I_i}{(1+k_d)^i} + \frac{RV}{(1+k_d)^n}$$

or $B_0 = I(PVAF_{i,n}) + RV(PVF_{i,n})$

where, $PVAF_{(i,n)}$ = Present Value Annuity Factor at the rate of interest i, and number of years, n

$PVF_{(i,n)}$ = Present Value Factor for a given rate of interest i, and number of years, n.

These values may be found from the Table A-4 and the Table A-3 respectively.

Now, the value of the bond under different situations can be ascertained as follows:

(1) Basic information **Coupon Rate 12%**
Redeemable at par
Maturity 10 years

If the required rate of return is 12%

B_0 = 120 (5.650) + 1,000 (.322)
= 678 + 322
= ₹ 1,000.

If required rate of return is 10%

B_0 = 120 (6.145) + 1,000 (.386)
= 737.4 + 386
= ₹ 1,123.40.

If required rate of return is 14%

B_0 = 120 (5.216) + 1,000 (.270)
= 625.92 + 270
= ₹ 895.92.

(2) Basic information **Coupon Rate 12%**
Redeemable at par
Maturity 8/12 years
Required Rate of return 14%

If maturity period is 8 years

B_0 = 120 (4.639) + 1,000 (.351)
= 556.68 + 351
= ₹ 907.68.

If maturity period is 12 years

B_0 = 120 (5.660) + 1,000 (.208)
= 679.20 + 208
= ₹ 887.20.

(3) Basic information **Coupon Rate 12%**
Required rate of return 12%
Maturity 10 years

If redemption amount is ₹ 950

B_0 = 120 (5.650) + 950 (.322)
= 678 + 305.90
= ₹ 983.90.

If redemption amount is ₹ 1,050

B_0 = 120 (5.650) + 1,050 (.322)
= 678 + 338.10
= ₹ 1,016.10.

Bond Valuation Behaviour : On the basis of the above calculations, certain conclusions regarding the behaviour of the valuation of bond can be arrived as follows:

(*a*) ***Relating to Required Rate of Return :*** If the required rate of return and the coupon rate are equal then the bond value will be equal to par value. Whenever the required rate of return differs from the coupon rate, the bond value also differs from the par value. If the required rate of return is more than the coupon rate, the bond value is less than the par value and *vice versa*. The calculations made in Example 17.1 situation (*i*) can be summarized as follows: When the required rate of return is less than the coupon rate, the bond has a premium value whereas if the required rate of return is more than the coupon rate, the bond has a discounted value.

(*b*) ***Relating to Maturity Period :*** Whenever the required rate of return is different from the coupon rate, the time to maturity also affects the value of the bond. In this respect the conclusion can be drawn with reference to the remaining period of maturity. When the required rate of return is different from the coupon rate and assumed constant until maturity, the value of the bond will approach its par value as the remaining period approaches its maturity. Of course, when the required rate of return is equal to the coupon rate, the bond value will remain same at par until it matures. Further, the longer the time to maturity of a bond, the greater its value changes in response to a given change in the required rate of return.

Bond Value in case of Semi-Annual Interest

In case, the firm decides to pay the interest on half-yearly intervals, then the Equation 17.3 for bond valuation needs to be modified. The basic equation remains same, however, following changes are required :

(*a*) Find out the half-yearly amount of interest by dividing the annual interest by 2.

(*b*) The number of years to maturity is multiplied by two to get the number of half-year periods till maturity.

(*c*) The required rate of return is also converted to the half-year required rate of return by dividing by 2.

After incorporating the above changes Equation 17.3 can be written as Equation 17.3A.

$$B_0 = \sum_{i=1}^{2n} \frac{I/2}{(1+k_d/2)^i} + \frac{RV}{(1+k_d/2)^{2n}} \qquad (17.3A)$$

Example 17.2

A bond of ₹ 1,000 bearing a coupon rate of 12% p.a. payable half-yearly is redeemable after five year at par. Find out the value of the bond given that the required rate of return is 14%.

Solution :

Basic information Annual Interest = ₹ 120
k_d = 14%
n = 5 years
RV = ₹ 1,000.

Putting these value in Equation 17.3A, value of the bond is

= 60 ($PVAF_{7\%, 10y}$) + 1,000 ($PVF_{7\%, 10y}$)
= 60 (7.024) + 1000 (.508)
= ₹ 929.

So, the value of the bond is ₹ 929. In the same case if the interest is payable on yearly interval, then the value of the bond as per Equation 17.3 is as follows:

= 120 ($PVAF_{14\%, 5y}$) + 1,000 ($PVF_{14\%, 5y}$)
= 120 (3.433) + 1000 (.519)
= ₹ 931.

Comparing the bond values under semi-annual interest payment (₹ 929) and annual interest payment (₹ 931), it can be seen that the bond value is the less when semi-annual interest is paid. This will always occur whenever the required rate of return is more than the coupon rate (hence the bond is being valued to give a discount figure). Further, in case the required rate of return is less than the coupon rate, the semi-annual value will be more than the value under annual interest payment.

YIELD TO MATURITY (YTM)

The cash flows in relation to a bond are consisting of regular interest payments and the redemption repayment. The rate of return, k_d, which makes the discounted values of these cash flows equal to the bond's market value, is known as the YTM of the bond. So, a bond's YTM may be defined as the *Internal Rate of Return* (IRR) for a given level of risk. When an investor evaluates bonds in order to make a buy or not to buy decision, the evaluation is often done by finding out the IRR of the bond. The IRR of a bond is nothing but the value of k_d in Equation 17.3. The YTM *i.e.*, the IRR of a bond may be found by solving Equation 17.3 for the value of k_d, given the value of B_0, the annual interest, I, the redemption value, RV and time to maturity, n. Thus, the rate of return expected from a bond if it is kept till maturity is called the YTM of the bond.

While finding out the YTM, an implied assumption is that all interest received are reinvested at a rate of return equal to bond's YTM. In order to find out the YTM of a bond, Equation 17.3 is to be solved for various values of k_d until the rate causing the calculated bond value equal to its current value. The trial and error procedure required to find out the value of k_d and the YTM can be explained with the help of Example 17.3 as follows :

Example 17.3

A bond of ₹ 10,000 bearing coupon rate 12% and redeemable in 8 years at par is being traded at ₹ 10,600. Find out the YTM of the bond.

Solution :

In order to find out the YTM, Equation 17.3 is to be solved for the value of k_d. For this purpose, different values are to be assumed for k_d and, the starting point can be the coupon rate itself.

At k_d = 12%
B_0 = 10,000 (since coupon rate = k_d)

This is less than the market price, so the k_d is reduced to 10%.

B_0 = ₹ 1,200 ($PVAF_{10\%, 8y}$) + 10,000 ($PVF_{10\%, 8y}$)

B_0 = 1,200 (5.335) + 10,000 (.467)

= ₹ 11,072.

By interpolating between 12% and 10%,

$$k_d = 12\% - \left(\frac{600}{600+472}\right)\times 2$$

$$= 12\% - 1.12 = 10.88\%$$

So, the YTM of the bond is 10.88%.

The above trial and error procedure to find out the IRR has been explained in detail in Chapter 4. This procedure requires a lot of calculations. A more practical alternative to this procedure to find out the YTM is the approximate yield formula as given in Equation 17.4.

$$\text{Approximate Yield} = \frac{I+\frac{RV-B_0}{n}}{(RV+B_0)/2}\times 100 \qquad (17.4)$$

[Note - Notations as given earlier]

To continue with the same example, the YTM may be approximated with the help of Equation 17.4 as follows:

$$YTM = \frac{1,200+(10,000-10,600)/8}{(10,000+10,600)/2}\times 100 = 10.92\%$$

The approximate YTM is therefore 10.92% and it is not significantly different from 10.88% calculated earlier by the IRR methodology. The approximate yield procedure may be adopted for the simplicity and reasonably accurate results provided by the method.

VALUATION OF CONVERTIBLE DEBENTURES

The convertible debenture is a debenture whose face value is fully or partially converted into equity shares. Further, the conversion (partially or fully) may be made compulsory or at the option of the debenture holders. For example, companies like Indian Rayon Ltd. and TISCO have issued compulsorily convertible debentures while Reliance Petroleum Ltd. and DLF Cements Ltd. had issued Optionally Convertible Debentures. The valuation of these convertible debentures can be taken up as follows:

Valuation of Compulsorily Convertible Debenture (CCD) : In case of a CCD, the debenture holders get interest at a specified rate for a specified period after which a part or full value of the CCD is converted into specific number of equity shares. In case of partial conversion, the residual portion continues to earn interest for the remaining period after which it is redeemed. The cashflows involved in case of valuation of CCD are:

(*a*) Periodic interest receivable from the company.

(*b*) Expected market price of the share received on conversion.

(*c*) Redemption amount, if any:

The CCD can be valued as per Equation 17.5.

$$B_0(CCD) = \sum_{i=1}^{n}\frac{I_i}{(1+k_d)^i}+\frac{mP_t}{(1+k_e)^t}+\frac{RV}{(1+k_d)^n} \qquad (17.5)$$

where, $B_0(CCD)$ = Value of a CCD

I = Interest amount receivable per year

k_e = Required rate of return on equity component

m = Number of shares received on conversion

P_t = Share price at the conversion time.

RV = Redemption value, if any.

n = Life of the debentures

k_d = Rate of discount

It may be noted that in case of partially convertible debentures, the annual interest before conversion and after conversion would be different. In case of fully convertible debenture, there will not be any RV.

Valuation of Optionally Convertible Debentures (OCD) : In case of OCD, the debenture holders may or may not opt for conversion. He will opt for conversion only when the value of the debenture after conversion is more than the value before conversion. So, he will have options as follows:

(*a*) *To continue as a debenture holder*: In this case, the value of the debenture is the straight debenture value as calculated by Equation 17.3

(*b*) *To opt for conversion* : In case the debenture holder decides to convert the debentures in equity shares, then the OCD becomes a CCD and its value may be ascertained as per Equation 17.5

It may be noted that the values in (*a*) and (*b*) above, are to be calculated at the time of conversion option only. This conversion option is generally available after 1 year, or 2 years or 3 years from the data of issue. During this period *i.e.*, from the date of issue till the conversion option date, the debenture holder has an option with him. This option or choice also has a value. So, the OCD would be valued as per (*a*) or (*b*) above (whichever is higher) + value of the option. The value of OCD may be presented as follows:

B_0 (OCD) = [Straight Debenture Value or Value as CCD (whichever is higher)] + Value of the Option

VALUATION OF DEEP DISCOUNT BONDS (DDB)

In recent years, some financial institutions have issued a debt instrument known as DDB. These DDB have an issue price and a par value or a face value which is payable to the holder on the maturity of DDB. For example, the IDBI issued DDB-Series 1 for a price of ₹ 2,700. These DDB were maturable in 25 years from the date of issue at par value of ₹ 1,00,000. No interest or any other type of payment is available to the holder before maturity. Since there is no intermediate payment between the date of issue and the maturity date, these DDB may also be called zero coupon bonds.

The valuation of DDB can be made on the same lines as the ordinary bonds are valued. Since, DDB generate only one future cashflow at the time of maturity, the value of the DDB may be taken as equal to the present value of this future cash flow discounted at the required rate of return of the investor for number of years of the life of the DDB. The value of DDB may be calculated with the help of Equation 17.6.

$$B_0\,(DDB) = \frac{FV}{(1+r)^n} \qquad (17.6)$$

where, B_0 (DDB) = Value of the DDB

FV = Face value of DDB payable at maturity.

r = The required rate of return.

n = Life of the DDB.

For example, a DDB is issued for a maturity period of ten years and having a par value of ₹ 25,000. Find out the value of the DDB given that the required rate of return is 15%.

Applying the Equation 26.6, the value of the DDB is :

$$B_0(DDB) = \frac{Rs.25,000}{(1+.15)^{10}}$$
$$= ₹\,25,000 \times (PVF_{15\%,\,10y})$$
$$= ₹\,25,000 \times .247 = ₹\,6,175.$$

So, the value of the bond is ₹ 6,175.

VALUATION OF PREFERENCE SHARES

Preference Share is a share which has two preferences attached with it. These are: to receive (*i*) a dividend at a fixed rate for a given period and (*ii*) a redemption amount at the time of redemption of preference share (in case of redeemable preference share) OR a dividend at the fixed rate perpetually till the liquidation of the company (in case of irredeemable preference shares). In many respects, the dividend on preference shares is similar to the interest payment on bonds, because in both the cases the rates are fixed. However, there are some differences between the preference share and the bonds. The bonds, being a type of a loan always matures but the preference shares may or may not mature. In case of irredeemable preference share, the redemption payment is available to preference shareholders only in case of liquidation of the company and not earlier. It may be noted, however, that after 1988, the companies in India cannot issue irredeemable preference shares (Section 55 of the Companies Act, 2013). The other difference is that missing a dividend on the preference shares does not amount to default whereas if interest payment on bonds is defaulted, then the bond holder can even sought liquidation of the company.

The preference shares may be considered as a hybrid security containing features of both the bonds and the share ownership. These features affect the valuation procedures of preference shares.

Assumptions : Two assumptions are relevant while ascertaining the value of preference shares as follows :

1. The dividends on preference shares are received once a year and that the first dividend is received at the end of one year from the date of acquisition/purchase.
2. The company always intends to pay the preference dividend so that the stream of preference dividend is considered to be known with certainty.

Redeemable Preference Share : The value of redeemable preference shares may be defined as the present value of the future cash flows expected from the company. The future cash flows associated with a redeemable preference share are (*i*) the stream of future dividends at a fixed rate of dividend, and (*ii*) the maturity payment at the time of redemption. These future cash flows are discounted at an appropriate rate to find out the value of the redeemable preference shares as follows :

$$P_0 = \frac{D_1}{(1+k_p)^1} + \frac{D_2}{(1+k_p)^2} \ldots\ldots \frac{D_n}{(1+k_p)^n} + \frac{RV}{(1+k_p)^n} \qquad (17.7)$$

$$\text{or,}\quad P_0 = \sum_{i=1}^{n} \frac{D_i}{(1+k_p)^i} + \frac{RV}{(1+k_p)^n}$$

where, P_0 = Value of a preference share,

D_i = Annual fixed dividend,

RV = Redemption value of preference share,

n = Life of the preference share, and

k_p = Required rate of return of the preference shareholders.

It may be noted that Equation 17.7 (valuation of preference share) is almost the same as Equation 17.3 (valuation of a bond) for the simple reason that both the preference shares and the bonds have similar future cash flows associated with them. Given the rate of dividend, redemption amount, life of the preference share and required rate of return of the preference shareholder, the value of the redeemable preference shares can be ascertained with the help of Equation 17.7.

Irredeemable Preference Share : The value of irredeemable preference share may be defined as the present value of the perpetuity of fixed dividends on preference shares. Symbolically, it may be defined as

$$P_0 = \frac{D}{k_p} \qquad (17.8)$$

where, P_0 = Value of irredeemable preference share,

D = Fixed Annual dividend,

k = Required rate of return of preference shareholders.

VALUATION OF EQUITY SHARES

Every company must have equity share capital as it represents the real ownership interest. The management in general and the finance manager in particular, bear the responsibility of advancing the interest of the equity shareholders. The decision making process of the finance manager is directed towards the maximization of market price of the equity share. However, in practice the market price of a share is influenced by a host of factors and quite often unpredictable. So, a finance manager as well as an investor is often concerned with finding out the value of equity shares.

Conceptually, the valuation of the equity share is the most typical because of its residual ownership character. The equity shareholders receive the residual profits and also the residual assets in case of liquidation. From the point of view

of calculation also, the valuation of equity share is difficult for (*i*) the rate of dividend is not given, and (*ii*) unlike rate of interest or rate of preference dividend which remain constant over the life of the security, the rate of dividend on equity shares may vary over the years. So, the normal valuation model as applied to the bonds and the preference shares cannot be applied for valuation of equity shares.

Assumptions : While ascertaining the value of equity shares, different assumptions are made regarding the company's future profits, the amount and the timing of the dividends, the required rate of return etc. Therefore, different approaches have been developed for the valuation of equity shares. These different approaches however, make the following assumptions regarding the basic characteristics of equity shares:

1. Equity shares do not have any redemption date.
2. Equity shares do not have any given redemption or liquidating value. In case of liquidation of the company, their claim is residual in nature and arising in the last (after paying all external liabilities and the preference shareholders).
3. Dividends on equity shares are neither guaranteed nor compulsory. Further, neither the rate nor the timing of dividend is specified. So, the dividend can vary in any direction.

   Different approaches to the valuation of the equity shares can be analyzed as follows:

   (*a*) Accounting concept of valuation.

   (*b*) Valuation based on dividends.

   (*c*) Valuation based on earnings.

Valuation of Equity Shares based on Accounting Information

The accounting information and the financial statements, particularly the balance sheet, can provide sufficient data to find out the value of equity shares. Two popular valuation models based on accounting information are as follows:

(*i*) **Book value or Balance Sheet value (BV) :** The BV of an equity share is simply the value of firm's ownership (based on balance sheet values) divided by the number of equity shares. So, the BV is equal to sum of all the items given as equity shareholders funds in the balance sheet (*i.e.,* equity share capital + accumulated profits – all accumulated losses) divided by the number of equity shares. An implied assumption in the BV valuation is that all assets are expected to realize an amount equal to their value stated in the balance sheet.

The BV of an equity share is based upon accounting information and thus can be easily calculated. However, it ignores the profitability of the firm. The BV also lacks sophistication as it is based upon the balance sheet which incorporates the historical figures, most of which might have become outdated. So, the BV fails as an objective measure of valuation of equity shares.

(*ii*) **Liquidation Value (LV) :** The LV of an equity share is the amount of cash that would be received from the company if all it's assets are sold and the liabilities (including preference shares, if any) are paid. The remaining amount will then be distributed among the equity shareholders. If there is no remaining/residual amount after payment to liabilities, then equity shareholders receive no payment and hence the LV will be zero.

The concept of LV seems to be better and more realistic than the BV, as the former is based upon the current realizable values instead of historical book values. However, the LV also lacks consideration of profitability of the firm. Further, the LV, requires finding out the realizable value all the assets which is not an easy task.

So, both these methods based on accounting information are not objectively giving the value of equity shares. However, like the BV, these methods do provide an idea of worth of a share to a shareholder who is more cautious about his capital investment in the shares, rather than the return he is expected to receive on his investment.

Valuation of Equity Shares based on Dividends

An investor buys or acquires an equity share in expectation of (*i*) a stream of future dividends from the company and (*ii*) resale price of the equity share after some time when he is no longer interested in holding the share. The owner of a share receives dividends as a compensation for investing in the firm. So, as long as, the firm is operating profitably and the investor holds the shares, he would be expecting to receive a dividend from the company. So, the dividends play a crucial and important role in determining the value of equity shares. Though there is no legal compulsion to pay dividend on equity shares, still most companies prefer to pay dividends in order to satisfy the expectations of their shareholders.

Assumptions : Valuation of equity shares based on dividends requires the following assumptions:

1. The dividends are payable annually.
2. The first dividend is received after one year from the date of acquisition/purchase.
3. Sale of equity share, if any, occurs only at the end of a year and at the ex-dividend terms.

The value of an equity share applying the basic valuation model (Equation 17.2) may be defined as equal to the present value of all future benefits which the share is expected to provide in the form of dividends over an infinite period. The future selling price and capital gain/loss, if any, is ignored because theoretically speaking, what is sold is the right to all future/subsequent dividends. So, from valuation point of view only the infinite stream of dividends is relevant.

Thus, the value of equity share is the sum of the present values of future cash flows (in the form of dividends) discounted at the required rate of return of the investors. By modifying the Equation 17.3, the valuation of equity shares may be ascertained with the help of Equation 17.9.

$$P_0 = \frac{D_1}{(1+k_e)^1} + \frac{D_2}{(1+k_e)^2} \ldots\ldots\ldots \frac{D\infty}{(1+k_e)^\infty} \quad (17.9)$$

where, P_0 = Value of the Equity Share.
D_i = Expected dividends over the years.
k_e = Required rate of return of the equity investors.

This valuation model for the valuation of equity shares is just the same as it is for the present value of any other asset. In this case, the dividend stream is discounted by the rate of return that can be earned in the capital market on other securities of comparable risk. The rationale for this model lies in the present value rule: ***The value of any asset is the present value of expected future cash flows, discounted at a rate appropriate to the riskiness of the cash flows being discounted.***

Equation 17.9 (as a valuation model of equity shares) on the face of it, appears to ignore the future selling price of equity shares. Many investors buy equity shares only for capital gains at a later stage. Some investors buy equity shares even if there is no current dividend being paid on them. Does it mean that the above valuation model (Equation 17.9) is not appropriate? No, the above model does not ignore the selling price and the capital gain/loss. Instead, it incorporates the selling price indirectly. This can be substantiated as follows:

Say, an investor buys an equity shares and plans to hold it for 2 years. His cash flows would comprise of 2 dividends and a selling price. In terms of general valuation model (Equation 17.3), the value of the equity shares is :

$$P = \frac{D_1}{(1+k_e)^1} + \frac{D_2}{(1+k_e)^2} + \frac{P_2}{(1+k_e)^2} \quad (17.10)$$

where, P_2 = Expected selling price at the end of year 2

Now, the value of the equity share at the end of year 2 *i.e.* P_2 depends upon the future dividends after year 2. In other words, the value of the equity share at the end of the year 2, P_2, depends upon the subsequent dividends. The investor buying the share at the end of year 2 plans to hold the share for another 3 years. The price he would be ready to pay *i.e.* P_2 is equal to :

$$P_2 = \frac{D_3}{(1+k_e)^1} + \frac{D_4}{(1+k_e)^2} + \frac{D_5}{(1+k_e)^3} + \frac{P_5}{(1+k_e)^3} \quad (17.11)$$

$$\text{Similarly, } P_5 = \frac{D_6}{(1+k_e)^1} + \frac{D_7}{(1+k_e)^2} \ldots\ldots\ldots\ldots \frac{P_n}{(1+k_e)^{n-5}} \quad (17.12)$$

Now, putting the Equations 17.11 and 17.12 in Equation 17.10, the position is :

$$P_0 = \frac{D_1}{(1+k_e)^1} + \frac{D_2}{(1+k_e)^2} + \ldots\ldots\ldots\ldots \frac{D_7}{(1+k_e)^7} + \ldots\ldots \frac{P_\infty}{(1+k_e)^\infty}$$

This is nothing but Equation 17.9 itself. Equation 17.9 does not include the selling price explicitly but it definitely includes it implicitly. Thus, the value of an equity share is the present value of all future dividends expected to be paid by the company over an infinite horizon. Further, that the total value of firm's equity shares must be equal to the discounted value of future dividends paid by the firm. But a word of caution here. The above model includes only those dividends which will be paid on the existing shares. If the firm decides to issue additional equity shares at any time in future, then these new shares will also be entitled to subsequent dividend stream. So, the value of firm's equity shares is equal to the discounted value of that portion of total dividends stream which will be paid on the equity shares outstanding today.

From the valuation view point, only the expected dividends are relevant. However, the future dividends from a company may show different patterns. The company may pay dividends at a constant rate or constantly growing rate or otherwise. This uncertainty regarding the pattern of dividends is what makes the valuation of equity shares a typical job. Three types of dividends patterns can be assumed and valuation of equity shares under all these three types of patterns can be ascertained. These three assumptions of dividend patterns are :

(*i*) Zero growth in dividends or constant dividends.
(*ii*) Constant growth in dividends.
(*iii*) Variable growth in dividends.

(*i*) **Zero growth in dividends or Constant dividends :** This is the simplest type of a dividend pattern in which the dividend amount remains constant over years. The dividend stream therefore, is a long term annuity, or almost a perpetuity. Symbolically,

$$D_1 = D_2 = D_3 = D_4 \ldots = D_\infty$$

The value of equity shares under constant dividends assumption is ascertained by dividing yearly dividend by the required rate of return of the equity investors as follows :

$$P_0 = \frac{D}{k_e} \quad (17.13)$$

where, P_0 = Value of equity share,
D = Annual dividend, and
k_e = Required rate of return of equity investors.

This model requires no estimation of future dividends and no forecast of future selling price and therefore is simple to operate. Dividend expected at the end of year 1 will help to find out the value of the equity share. However, the unrealistic assumption of the constant dividends itself is the shortcoming of this method. No company may be expected to pay forever a fixed dividends on equity shares.

Example 17.4

A firm pays a dividend of 20% on the equity shares of face value of ₹ 100 each. Find out the value of the equity share given that the dividend rate is expected to remain same and the required rate of return of the investor is 15%.

Solution :

In this situation, the following information is given:

$$k_e = 15\%$$
$$D = 20 \text{ (}i.e.\text{, 20\% of ₹ 100)}$$

Therefore, $P_0 = \frac{20}{15} = ₹ 133.33$

(*ii*) **Constant growth in dividends :** This assumption seems to be a realistic one and that is why this has been the most common valuation model. The assumption is that the dividends will grow constantly at a rate, *g*, every year. If a firm pays a dividend of D_0 at present then dividend at the end of year 1 will be D_1 *i.e.*, $D_0 (1 + g)$ and dividend at the end of year 2 will be $D_2 = D_0 (1 + g)^2$ and so on. Therefore, dividend payable in any future year can be ascertained with the help of the following:

$$D_t = D_0 (1 + g)^t$$

or $$D_t = D_{t-1} (1 + g)$$

The valuation model under constant growth rate, *g*, can be stated under the following assumptions :

(*i*) The growth rate, *g*, is constant and compounding annually.

(*ii*) The growth rate, *g*, is less than the required rate of return of the equity investors.

(*iii*) The growth rate, *g*, is subjective estimate of the investor.

The valuation of the equity share under constant growth model can be ascertained with the help of the following equation :

$$P_0 = \frac{D_0 (1+g)^1}{(1+k_e)^1} + \frac{D_0 (1+g)^2}{(1+k_e)^2} \ldots\ldots\ldots \frac{D_0 (1+g)^\infty}{(1+k_e)^\infty} \quad (17.14)$$

$$\text{or, } P_0 = \sum_{i=1}^{\infty} \frac{D_0 (1+g)^i}{(1+k_e)^i}$$

The Equation 17.14 indicates an infinite summation. As $k_e > g$, Equation 17.14 can be mathematically transformed into

$$P_0 = \frac{D_0 (1+g)}{k_e - g}$$

and since, $D_1 = D_0 (1 + g)$, therefore

$$P_0 = \frac{D_1}{k_e - g} \quad (17.15)$$

The Equation 17.15 explains the current price P_0, in terms of expected dividend at the end of year 1, D_1, the projected growth rate, *g*, and the expected rate of return of the investors, k_e. Alternatively, Equation 17.15 can be used to find out an estimate of k_e from the given D_1, P_0 and *g* as follows:

$$k_e = (D_1/P_0) + g$$

So, k_e, which is also called the market capitalization rate is equal to the dividend yield *i.e.*, $(D_1 \div P_0)$ *plus* the expected growth rate in dividends, *g*.

The valuation model given in Equation 17.15 is easy to compute and apply and also recognizes the infinite stream of dividends with growth rate, *g*. Moreover, the valuation models given in Equations 17.13 and 17.15 are easy to work with than the general statement that 'price equals the present value of expected future dividends' (Equation 17.9). Suppose, a share having a face value of ₹ 100 is expected to pay a dividend of 12% at the end of year 1 and the growth rate in dividends is estimated is to be 3%. If the investor has a required rate of return of 16%, the value of the equity share is:

$$P_0 = \frac{12}{16 - .03} = ₹ 92.30.$$

The value of an equity share is positively correlated with growth rate and negatively correlated with required rate of return. Suppose, a firm is presently paying a dividend of ₹ 1 which is expected to grow at growth rate, *g*, annually. The value of the share under different growth rates and different required rates of return have been summarized in Table 17.2.

TABLE 17.2 : VALUATION OF SHARES UNDER DIFFERENT COMBINATIONS.

Growth Rates	Required Rates of Return			
	10%	12%	14%	16%
2%	12.50	10.00	8.33	7.14
4%	16.67	12.50	10.00	8.13
6%	25.00	16.67	12.50	10.00
8%	50.00	25.00	16.67	12.50

The values given in Table 17.2 reflect the sensitivity of the growth rate and the required rate of return. The higher the growth rate, higher will be the value for a given required rate of return. Further, the higher the required rate of return, lesser will be value for a given growth rate. The constant growth model is an extremely useful theoretical model to value the equity shares. However, the basic shortcoming of the model is its assumption of constant growth in dividends forever. Dividends from no company can continue to grow at a constant rate. Eventually, the profitability of every firm will fall and there is an all likely chance that dividends will also decrease. Moreover, the assumption of constant growth rate in dividends is a difficult assumption to meet, especially given the volatility of earnings.

(*iii*) **Variable growth in dividends :** The zero growth rate and the constant growth rate assumptions of dividend patterns are extreme assumptions. In a practical situation, the dividend from a company may show one-growth rate for few years, followed by another growth rate for next few years and then yet another growth rate for a next few years and so on. For example, for five years the growth rate in dividends may be 2%, then it may be 3% for next five years, then it may stick to 4% growth rate infinitely. This means that the dividend will grow at 2% annually for years 1 to 5, at 3% annually for years 6 to 10 and at 4%

annually from the year 11 onwards. Equation 26.14 can be modified to take care of such growth situations to find out the value of the equity shares as follows :

$$P_0 = \sum_{i=1}^{5} \frac{D_0(1+g_1)^i}{(1+k_e)^i} + \sum_{i=6}^{10} \frac{D_5(1+g_2)^{i-5}}{(1+k_e)^i} + \sum_{i=11}^{\infty} \frac{D_{10}(1+g_3)^{i-10}}{(1+k_e)^i} \quad (17.16)$$

where, P_0 = Value of equity share.
g_1, g_2 and g_3 = Different growth rates for different periods, and
k_e = Required rate of return of equity investors.

To find out the value of equity shares under varying growth rates as per Equation 26.16, the following procedure may be adopted :

Step 1. Find the value of cash dividend at the end of each year during the period over which the growth rate is changing. In the above example, the growth rate is changing over 10 years (2% growth rate for first five years and 3% growth rate for next five years).

Step 2. Find out the present values of these cash dividends for different years by discounting at the required rate of return k_e. For this purpose, the cash dividend is to be multiplied by the respective discounting factor to find out the present value. Add up all these present values.

Step 3. Find out the value of the equity share at the end of the last year of the varying growth period *i.e.* the 10th year as follows :

$$P_{10} = \frac{D_{11}}{k_e - g_3}$$

This value P_{10} represents the present value of all expected dividends from year 10 onwards at a constant growth rate in dividends, g_3. Find out the present value of this figure by discounting to period 0.

Step 4. Sum of the figures arrived in Step Nos. 2 and 3 is the value of the equity share. If there are more breaks in growth rates, then the similar procedure may be adopted.

Example 17.5

A firm is paying a dividend of ₹ 1.50 per share. The rate of dividend is expected to grow at 10% for next three years and 5% thereafter infinitely. Find out the value of the share given that the required rate of return of the investor is 15%.

Solution :

For this situation, the following information is available:

k_e = 15% D_0 = ₹ 1.50
g_1 = 10% (for 3 years) g_2 = 5% (infinitely)

Now, the value may be calculated as follows :

End of Year	Div. Amt. (₹)	$PVF_{(15\%, n)}$	PV
1	1.65	.870	1.44
2	1.82	.756	1.38
3	2.00	.658	1.32
			₹ 4.14

₹ 4.14 is the present value of dividends expected from the company for first three years. The value of the equity shares at the end of year three will be as follows :

$$P_3 = \frac{D_3(1+g)}{k_e - g}$$

$$P_3 = \frac{2(1.05)}{15 - .05} = ₹ 21$$

The value of the share at the end of the year 3 will be ₹ 21. The present value of ₹ 21 is:

$$= ₹ 21 \times (PVF_{15\%, 3y})$$
$$= ₹ 21 \times (.658) = ₹ 13.82$$

The value of the share at present is ₹ 4.14 + ₹ 13.82 *i.e.*, ₹ 17.96.

Valuation of the Share Currently not paying Dividends

There may be numerous cases where the firm is not able to pay any dividend on equity shares because of insufficient profits during early years or gestation period or otherwise. Some of the firms may not like to pay early dividends because they require funds for growth purposes. The dividend valuation models discussed above can take care of this type of situations also. In order to find out the worth of the share today, an attempt is made first to find out the worth of the share once the dividends are paid. Then the present value of this future price is turned to get the price of the share today. For example, a firm is not expected to pay any dividend for first 3 years but thereafter will be paying a dividend of ₹ 2 growing at 10% p.a. forever. The value of the share, given the required rate of return 15%, can be calculated as follows :

As per the constant growth rate model, the value of the share at the end of year 3 will be:

$$P_3 = \frac{D_4}{k_e - g}$$

$$= \frac{2}{.15 - .10} = ₹ 40$$

Now, this is the value of the share at the end of year 3. This value should now be discounted at 15% to find out the present value.

$$P_0 = P_3 \times (PVF_{15\%, 3y})$$
$$= ₹ 40 \times (.658) = ₹ 26.32$$

So, the value of the share is ₹ 26.32.

Valuation of Equity Shares based on Earnings

Some firms have extensive growth opportunities and require funds to take up new projects. So, these firms may retain profits (wholly or partially). This reduces the amount of dividends to the shareholders. The retained earnings are reinvested internally to generate higher profits in future. Investors are willing to forego cash dividends today in exchange for higher earnings and expectation of higher dividends in future. The value of an equity share in such a case, may be determined on the basis of the earnings of the firm. The earnings of the firm may be expressed as earning per share (EPS) which is ascertained from the accounting information of the firm. There are different approaches to find out the value of the equity share on the basis of the earnings of the firm. These include Gordon Valuation model, Walter's model, the P/E Ratio approach.

(*a*) **The Gordon's Model :** This valuation model presupposes that earnings of the firm are either distributed among the shareholders or are reinvested within the business. The growth in dividends in future would therefore depend upon the profits retained and the rate of return on these retained profits. This is already discussed in Chapter 10.

(*b*) **Walter's Model :** The Walter's Model supports the view that the market price of a share is the sum of (*i*) present value of an infinite stream of dividends and (*ii*) present value of an infinite stream of returns from retained earnings. The investors will evaluate the retention of earnings (resulting in lesser dividends) in the light of (*a*) the rate of return, r, earned by the company on these retained earnings and (*b*) the opportunity cost of equity investors, k_e. Depending upon the relationship between r and k_e, the investors will value the expected capital gains and will thus value the share.

The Walter's Model has been discussed in detail in Chapter 10.

(*c*) **Price-Earnings Ratio (P/E Ratio) :** The P/E ratio is the most common earnings valuations model. The P/E ratio is the ratio between the price of a share and it's EPS. For example, if a share whose EPS is ₹ 10 is having a market price of ₹ 250, then its P/E ratio is 250/10 = 25. It means that the market price of the share is 25 times that of the EPS. As per P/E ratio approach, the value of the share is expressed as:

$$\text{Value} = \text{EPS} \times \text{P/E ratio.}$$

But there is a question as to how to estimate/forecast the P/E ratio? One method is to estimate the P/E ratio of the similar type of a company or the industry as whole. Then this estimate may be further adjusted in the light of the characteristics and features of the particular firm and its share. The P/E ratio before being applied to a particular case, to find out the value of the share may be analyzed for the risk involved in the firm, in the share, growth prospects of the firm, stability of earnings of the firm etc. The higher the growth prospects of the firm and stability of a dividends, larger would be the P/E ratio. Similarly, higher the risk of the firm, lower would be P/E ratio. Other considerations while determining the P/E ratio may be the quality of the management, the dividend payout ratio, accounting policies etc.

The other important variable in the price earnings valuations of a share is the EPS. The EPS depends upon the accounting information. The EPS, as the term itself suggests, denotes the earnings of the firm attributable to one share. The EPS may be calculated as follows:

$$\text{EPS} = \frac{\text{Profit after Tax – Preference Dividend}}{\text{Number of Equity Shares}}$$

So, the amount of earnings relevant for the EPS is the profit after depreciation, interest, tax and preference dividend, if any. The earnings then are divided by the number of outstanding equity shares on the last day of the financial year for which the earnings have been considered.

The P/E ratio as the basis of valuation of share has been quite common and is often used in business dailies and journals. The share quotations are often supplemented with the P/E ratios. It may be observed that some companies have very high P/E ratio while others have a low P/E ratio. The share price at any particular point of time reflects investor's expectations of future operating and investment performance by the firm. The shares of growing firms sell at high P/E ratio because investors are willing to pay a higher price now for expected higher returns in future.

It may be argued that the P/E valuation does not have a conceptual explanation as the accounting profits have no relation with the cash flow generations. Moreover, the earnings being an accounting figure is subject to the accounting policies being followed. Almost every firm's earnings can be altered substantially by adopting different accounting policies and procedures. For example, a change in depreciation method will affect the earnings as reported in the Income Statement of the firm and hence the EPS will also be affected.

A high P/E ratio as well as a low P/E ratio, both are subject to misunderstanding. A high P/E ratio does not necessarily points out a good firm because a high P/E ratio may appear because of a low EPS. Similarly, low P/E ratio may appear because of high EPS.

Although the current earnings may not give a good indications of cash flow generation, they definitely give an indication of the ability of the firm to pay dividends in future. Further, the P/E valuation is easy to be adopted as fewer estimates are required for its application. It is often argued that given the P/E ratio for equity shareholders, the share price can be forecasted by estimating the future EPS and then multiplying by the expected P/E ratio.

POINTS TO REMEMBER

- Valuation is the process of determining the worth to a security. The theoretical framework is based on the concept of TVM and the risk-return perception of the investors.
- In financial management, the valuation of a security is equal to the present value or all expected future cash flows over the relevant period. The present value is found by discounting the future cash flows at an appropriate rate.
- Valuation of a bond is found with reference to par value, rate of interest, maturity period and redemption value. The value of a bond may be defined as the present value of future interest flows and the redemption value.
- In case of convertible bonds, the value may be taken as the present value to interests, redemption value, it any, and the market price of shares on the date of conversion.
- Valuation of preference shares is akin to valuation of bonds.
- Valuation of equity shares is typical because neither the rate of dividend nor the payment of dividend is compulsory.
- Valuation of equity shares may be found with reference to expected dividends or expected earnings.
- Other Approach to valuation of equity shares are based on PE ratio, CAPM, *etc.*
- In case of dividends, the expected stream of dividends may be of different types such as constant dividends, dividends growing at constant rate or dividends growing at varying rates.

GRADED ILLUSTRATIONS

Illustration 17.1

A ₹ 1,000 bond matures in 20 years and offers a 9% coupon rate. The required rate of return is 11%. Compute the bonds's value.

Solution :

The annual interest payment is ₹ 90. At the end of the year 20, the bondholder receives the ₹ 90 interest payment and the ₹ 1,000 par value. The present value of the interest payments is obtained by using the present-value annuity factor for 11% and 20 payments:

$$PV = \text{Interest} \times (PVAF_{11\%, 20y})$$
$$PV = ₹\,90 \times (7.963) = ₹\,719.67$$

The present value of the ₹ 1,000 principal repayment is obtained by using the present-value, single-payment factor for 11% and 20 years:

$$PV = \text{Amount} \times (PVF_{11\%, 20y})$$
$$= ₹\,1{,}000 \times (.124) = ₹\,124$$

Therefore, the bond's value is ₹ 840.67 (₹ 716.67 + 124.00).

In this example, the discount rate exceeds the coupon rate. As a consequence, the bond's intrinsic value is less than its par value.

Illustration 17.2

A ₹ 5,000 bond with a 10% coupon rate matures in 8 years and currently sells at 97%. Is this bond a desirable investments for an investor whose required rate of return is 11%.

Solution :

The present value of the bond is:

$$PV = \text{Interest} \times (PVAF_{11\%, 8y}) + \text{Face Value} \times (PVF_{11\%, 8y})$$
$$= ₹\,500 \times (5.146) + ₹\,5{,}000 \times (.434)$$
$$= ₹\,4{,}743$$
$$\text{Current Price} = ₹\,5{,}000 \times 97\% = 4{,}850$$

Since, the bond is available at a price higher than its present value of returns, the investment in bond is not desirable.

Illustration 17.3

The Elu Co. is contemplating a debenture issue on the following terms:

Face Value = ₹ 100 per Debenture.
Term to Maturity = 7 Years.

Coupon rate of Interest:

Years 1-2 = 8% p.a.
3 – 4 = 12% p.a.
5 – 7 = 15% p.a.

The Current market rate of interest on similar debentures is 15% p.a. The company proposes to price the issue so as to yield a (compounded) return of 16% p.a. to the investors. Determine the issue price. Assume the redemption on debenture at a premium of 5%.

Solution :

The interest payments over the life of the debentures and their present values are given in the following table:

Year	Interest (₹)	PVF @ 16%	Present Value (₹)
1	8	.862	6.896
2	8	.743	5.944
3	12	.641	7.692
4	12	.552	6.624
5	15	.476	7.140
6	15	.410	6.150
7	15	.354	5.310
		Total	45.756

The present value of the redemption amount of ₹ 105 (₹ 100 + ₹ 5) @ 16% p.a. is

₹ 105 × .354 = ₹ 37.17

Therefore, the present value of the debenture is ₹ 45.76 + ₹ 37.17 = ₹ 82.93. The company should issue the debentures at this value in order to yield a return of 16% to the investors.

Illustration 17.4

Zed Ltd. has just paid a dividend of ₹ 13 per share. As a part of its major reorganization of its operations it has stated that it does not intend to pay any dividend for the next two years. In three years time it will commence paying dividend at ₹ 10 per share and the Directors have indicated that they expect to achieve dividend growth at 12% p.a. thereafter.

If the reorganization does not take place, dividend will be paid in the next two years and the expected dividend growth will remain at the present level of 6% p.a. The firm's cost of equity is 18% (*i.e.,* the return expected by the equity investors) and will be unaffected by the reorganization. Calculate the value of firm's shares in both the situations.

Solution :

Situation I (Present Position) :

$$\text{The share price is, } P_0 = \frac{D_0(1+g)}{k_e - g}$$

$$= \frac{₹\ 13\ (1.06)}{.18 - .06} = ₹\ 114.83$$

Situation II (Proposed Position) : The share price after announcing the reorganization (assuming that the market believes the Director's forecast of growth in dividends) is :

Share price at the end of year 2:

$$\text{The share price is, } P_2 = \frac{D_3}{k_e - g}$$

$$= \frac{₹\ 10}{.18 - .12} = 166.67$$

The present value of this price is :

$$= ₹\ 166.67 \times (1/1.18)^2$$

$$= ₹\ 119.70.$$

Therefore, the price in the proposed situation is higher and so the Directors may adopt the reorganization process.

Illustration 17.5

A firm had paid dividend at ₹ 2 per share last year. The estimated growth of the dividends from the company is estimated to be 5% p.a. Determine the estimated market price of the equity share if the estimated growth rate of dividends (*i*) rises to 8% and (*ii*) falls to 3%. Also find out the present market price of the share, given that the required rate of return of the equity investors is 15.5%.

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Solution :

In this case, the company has paid a dividend of ₹ 2 during the last year. The growth rate *g,* is 5%. Then, the current year dividend (D_1) with the expected growth rate of 5% will be ₹ 2.10.

$$\text{The share price is, } P_0 = \frac{D_1}{k_e - g}$$

$$= \frac{₹\ 2.10}{.155 - .05} = ₹\ 20$$

In case the growth rate rises to 8% then the dividend for the current year (D_1) would be ₹ 2.16 and the market price would be:

$$\text{The share price is, } P_0 = \frac{D_1}{k_e - g}$$

$$= \frac{₹\ 2.16}{.155 - .08} = ₹\ 28.80$$

In case the growth rate falls to 3% then the dividend for the current year (D_1) would be ₹ 2.06 and the market price would be:

$$\text{The share price is, } P_0 = \frac{D_1}{k_e - g}$$

$$= \frac{₹\ 2.06}{.155 - .03} = ₹\ 16.48$$

So, the market price of the share is expected to vary in response to change in expected growth rate in dividends.

Illustration 17.6

Calculate the value of equity share from the following:

Equity Share Capital (₹ 20 each)	₹ 50,00,000
Reserves and Surplus	₹ 5,00,000
15% Secured Loans	₹ 25,00,000
12.5% Unsecured Loans	₹ 10,00,000
Fixed Assets	₹ 30,00,000
Investments	₹ 5,00,000
Operating Profit	₹ 25,00,000
Tax Rate	50%
P/E Ratio (Price-Earnings)	12.5

Solution :

In the given situation, the value of the share can be ascertained on the basis of earnings of the firm and the price-earning multiple as follows:

Value = EPS × P/E Ratio.

The P/E Ratio is given and the EPS may be ascertained as follows:

	Amount (₹)
Operating Profit *i.e.* EBIT	25,00,000
Less: Interest on 15% Secured Loans	3,75,000
Interest on 12.5% Unsecured Loans	1,25,000
Profit before Tax (PBT)	20,00,000
Tax @ 50%	10,00,000
Profit after Tax (PAT)	10,00,000
Number of Equity Shares (₹ 50,00,000/20)	2,50,000
Therefore, EPS (₹ 10,00,000/2,50,000)	4.00
P/E Ratio (given)	12.5

Therefore,

$$\text{Value} = \text{EPS} \times \text{P/E Ratio.}$$
$$= 4 \times 12.5 = ₹\ 50.$$

Illustration 17.7

An investor has invested his savings in a company from whom dividends are expected to grow @ 20% for 15 years and thereafter @ 7% forever. Find out the value of the equity share given that the current dividend per share is ₹ 1 and the required rate of return of the investor is 9%.

Solution :

The dividends from the company are expected to grow at 20% p.a. for first 15 years and at 7% p.a. thereafter forever. Therefore, the value of the equity share is to be ascertained in two stages as follows :

Stage 1: Calculation of present value of dividends for 15 years:

Year	Dividend (₹) (g = 20%)	PVF at 9%	Present Value (₹)
1	1.200	.917	1.100
2	1.440	.842	1.212
3	1.728	.722	1.334
4	2.074	.708	1.334
5	2.488	.650	1.468
6	2.986	.596	1.780
7	3.583	.547	1.960
8	4.300	.502	2.159
9	5.160	.460	2.376
10	6.192	.442	2.613
11	7.430	.388	2.883
12	8.916	.356	3.174
13	10.696	.326	3.488
14	12.839	.299	3.839
15	15.407	.275	4.237
Total	86.442		34.955

So, the total dividends of ₹ 86.44 are expected from the company during next 15 years whose present value @ 9% is ₹ 34.96.

Stage 2 : The value of the equity share at the end of 15th year depends upon the dividend for the 16th year (D_{16}), k_e and the growth rate, g, as follows :

$$D_{16} = D_{15}\,(1 + g) = ₹\ 16.49$$

The share price is, $P_{15} = \dfrac{D_{16}}{k_e - g}$

$$= \frac{₹\ 16.49}{.09 - .07} = ₹\ 824.50$$

This amount of ₹ 824.50 is realizable after 15 years. Therefore, the present value of this amount at 9% is ₹ 226.74 (*i.e.,* ₹ 824.50 × .275).

Now, the value of the share is the sum of the (*i*) present value of future dividend and (*ii*) present value of expected price at the end of year 15 *i.e.*

$$\text{Value} = ₹\ 34.96 + ₹\ 226.74$$
$$= ₹\ 261.70.$$

Illustration 17.8

A share of the face value of ₹ 100 has current market price of ₹ 480. Annual expected dividend is 30%. During the fifth year, the shareholder is expecting a bonus in the ratio of 1:5. Dividend rate is expected to be maintained on the expanded capital base. The shareholder intends to retain the share till the end of the eighth year. At that time the value of share is expected to be ₹ 1,000. Incidental expenses at the time of purchase and sale are estimated at 5% on the market price. There is no tax on dividend income and capital gain. The shareholder expects a minimum return of 15% per annum.

Should he buy the share? What is the maximum price he can pay for the share? Show complete working.

Solution :

In this case, if the investor buys the share then he will be receiving a stream of dividend for eight years and will be able to realize the selling price thereafter. The investor should buy the share only if the present worth of dividend stream and sales proceeds is more than the net cost being paid today.The decision can be evaluated as follows :

PRESENT VALUE OF DIVIDENDS AND SALE PROCEEDS

Year	Div./Sale	$PVF_{(15\%, n)}$	PV
1	₹ 30	.870	₹ 26.10
2	30	.756	22.68
3	30	.658	19.74
4	30	.572	17.16
5	36	.497	17.89
6	36	.432	15.55
7	36	.376	13.54
8	36	.327	11.77
8	1140	.327	372.78
			517.21
Less Cost of Share (₹ 480 + 24)			504.00
Net benefit			₹ 13.21

As the investor is getting a net benefit (in real terms) of ₹ 13.21, he should buy the share. It may be noted that in the 5th year, he will receive a bonus of .2 share and his total holding will be 1.2 shares. His dividend income for years 1-4 is 30% on

Face Value of 1 share *i.e.*, ₹ 30 per year. However, for 5th year onward, his dividend income will be 30% of Face Value of 1.2 shares *i.e.*, ₹ 36.

At the end of 8th year, he will dispose of his holding of 1.2 share @ ₹ 1,000 per share *i.e.*, ₹ 1,200, out of which 5% will be incidental expenses. So, his net receipt will be ₹ 1,200 – 60 = ₹ 1140 only.

The maximum price he should be ready to pay for the share is the present worth of dividend and sale proceed *i.e.*, ₹ 517.21. However, he has to pay 5% incidental expenses also. So, the price he should be ready to pay is :

$$517.21 \times \frac{100}{105} = ₹\ 492.58$$

If he buys the share for ₹ 492.58 he will have to pay incidental expenses of ₹ 24.63 also and his total outgo would be ₹ 517.21 which is equal to the present worth of expected inflows.

OBJECTIVE TYPE QUESTIONS

State whether each of the following statements is ***True (T)*** *or* ***False (F)****:*

(*i*) Valuation of bonds and of equity shares can be made by the same valuation model.

(*ii*) Equity shares cannot be valued because equity shares have no redemption.

(*iii*) Intrinsic value and market price of equity shares are always equal.

(*iv*) BV of an equity share is the best measure of valuation.

(*v*) In Dividend discount model, the valuation of equity shares is based on expected stream of dividends.

(*vi*) In No-growth Dividend model, only next years' dividend is capitalised.

(*vii*) No-growth dividend model does not involve present value concept.

(*viii*) Gordon's Model and Constant Growth Model are one and same.

(*ix*) In Constant Growth model, the value of equity share is sensitive to growth rate.

(*x*) In Constant Growth model, the value of equity share is not sensitive to required rate of return.

(*xi*) For companies which are not expected to pay dividends, equity shares cannot be valued.

(*xii*) In Walter's Model, the value of equity share depends upon the DP ratio.

(*xiii*) β factor is a measure of value of share.

(*xiv*) CAPM helps in determining required rate of return.

(*xv*) Face Value, Issue Price and Market Value of bond must be same.

(*xvi*) Market Value of debt instruments depends upon the market value of collateral.

(*xvii*) Basic or Current yield on a bond is calculated with reference to the face value or issue price of a debenture.

(*xviii*) YTM of a bond is the same as the IRR of the bond investment.

(*xix*) Bond valuation depends upon the discounted cash flow technique.

(*xx*) Bond Valuation is sensitive to both the interest rate and the required rate of return of the investor.

[**Answer :** *(i) F, (ii) F, (iii) F, (iv) F, (v) T, (vi) T, (vii) F, (viii) T, (ix) T, (x) F, (xi) F, (xii) T, (xiii) F, (xiv) T, (xv) F, (xvi) F, (xvii) F, (xviii) T, (xix) T, (xx) F*]

MULTIPLE CHOICE QUESTIONS

1. Deep Discount Bonds are issued at :
   (*a*) Face Value,
   (*b*) Maturity Value,
   (*c*) Premium to Face Value,
   (*d*) Discount to Face Value.

2. Principal value of a bond is called the :
   (*a*) Maturity Value,
   (*b*) Issue Price,
   (*c*) Par Value,
   (*d*) Market Price.

3. If the required rate of return of a particular bond is less than coupon rate, it is known as :
   (*a*) Discount Bond
   (*b*) Premium Bond
   (*c*) Par Bond
   (*d*) Junk Bond.

4. Market interest rate and bond price have :
   (*a*) Positive relationship
   (*b*) Inverse relation
   (*c*) No relationship
   (*d*) Same relationship

5. If a coupon bond is selling at discount, then which of the following is true ?
   (*a*) $P_0 <$ Par and YTM $<$ coupon
   (*b*) $P_0 <$ Par and YTM $>$ coupon

(*c*) $P_0 >$ Par and YTM $<$ coupon

(*d*) $P_0 >$ Par and YTM $>$ coupon

6. In the formula $k_e = (D_1/P_0) + g$, D_1/P_0 refers to:

(*a*) Capital gain yield

(*b*) Dividend yield

(*c*) Interest yield

(*d*) None of the above

7. The rate of interest payable on a bond is also called:

(*a*) Effective Rate of Interest,

(*b*) Yield to Maturity,

(*c*) Coupon Rate,

(*d*) Internal Rate of Return.

8. A long-term bond issued with collateral is called:

(*a*) Junk Bond,

(*b*) Treasury Bills,

(*c*) Debenture,

(*d*) Preference Share.

9. A company may call the bonds when:

(*a*) Interest rates have dropped,

(*b*) Interest rates have increased,

(*c*) It is not earning profits,

(*d*) None of the above.

10. Rate of Interest on convertible debenture is generally ..... the rate on non-convertible debentures:

(*a*) Lower than,

(*b*) Higher than,

(*c*) Same as,

(*d*) None of the above.

11. A 16% bond with a face value ₹ 250 is available for ₹ 200 in the market. They yield on the bond is:

(*a*) 16%

(*b*) 20%

(*c*) 80%

(*d*) 32%

12. At time to maturity comes closer, than market price of a bond approaches:

(*a*) Face Value,

(*b*) Redemption Value,

(*c*) Issue Price,

(*d*) Zero Value.

13. Market Price of Bond and Market Rate of Interest have:

(*a*) Inverse relationship,

(*b*) Positive relationship,

(*c*) No relationship,

(*d*) None of the above.

14. Which of the following is a feature of zero-coupon bonds?

(*a*) Sold at Par,

(*b*) Sold at premium,

(*c*) Pays no Interest,

(*d*) Not Redeemable.

15. Bonds that are covered by specific collaterals are called:

(*a*) Junk Bond,

(*b*) Floating Rate Bonds,

(*c*) Secured Bonds,

(*d*) Deep Discount Bonds.

16. Which of the following will cause an increase in bond values?

(*a*) Decrease in Redemption Amount,

(*b*) Decrease in Coupon Rate,

(*c*) Increase in Redemption Amount,

(*d*) Increase in Redemption Period.

17. Which of the following is always true for Bonds?

(*a*) FV of a Bond = Issue Price,

(*b*) Redemption Value = Amount received by bond-holder at maturity,

(*c*) Bonds are redeemable at market Value,

(*d*) All of the above.

18. In a 3 years Bond purchased and held till maturity, the rate earned is called:

(*a*) Coupon Rate,

(*b*) Yield to Maturity,

(*c*) Current Yield,

(*d*) Holding Period Return.

19. An investor should buy a bond if:

(*a*) Intrinsic Value $<$ Market Value,

(*b*) Intrinsic Value $>$ Market Value,

(*c*) Market Value $<$ Redemption Value,

(*d*) Market Value = Redemption Value.

20. In case the maturity period of a bond increases, the volatility:

(*a*) Increases,

(*b*) Decreases,

(*c*) Remains same,

(*d*) Both (*a*) and (*b*).

21. Current Market Price of a Bond is equal to its Par Value if:

(*a*) Face Value is ₹ 1000,

(*b*) Coupon is paid half yearly,

(*c*) Coupon Rate = Current Yield,

(*d*) It is a Government Bond.

22. If the coupon rate and required rate of return are equal, the value of the bond is equal to:
    (*a*) Market Value,
    (*b*) Par Value,
    (*c*) Redemption Value,
    (*d*) None of the above.
23. YTM of a Bond is not affected by:
    (*a*) Coupon Rate,
    (*b*) Issue Price,
    (*c*) Redemption Value,
    (*d*) Interest Amount.
24. If Coupon rate is less than Required Rate of Return; as the maturity approaches the discount on bond:
    (*a*) Increases,
    (*b*) Decreases,
    (*c*) Remains Constant,
    (*d*) None of the above.
25. An investor buys a bond today and sells after 3 months the rate of return realised in known as:
    (*a*) Yield to Maturity,
    (*b*) Current yield,
    (*c*) Holding Period Return,
    (*d*) Required Rate of Return.

[**Answers :** *1. (d), 2. (c), 3. (c), 4. (b), 5. (b), 6. (b), 7. (c), 8. (c), 9. (a), 10. (a), 11. (b), 12. (b), 13. (a), 14. (c), 15. (c), 16. (c), 17. (b), 18. (b), 19. (b), 20. (a), 21. (c), 22. (c), 23. (b), 24. (b), 25. (c)*]

ASSIGNMENTS

1. Write short notes on :
   (*a*) Yield to Maturity.
   (*b*) Valuation of Deep Discount Bonds.
   (*c*) Different Valuation Concepts.
2. What are the different methods of valuation of assets? Explain in detail the economic value concept.
3. Explain the concept of valuation of securities. Why is it important for the financial manager to understand valuation?
4. What are the differences and similarities in valuation of bonds and preference shares?
5. What are the factors involved in Bond valuation? Explain with example, the valuation of redeemable and perpetual bond.
6. Examine the relationship between interest rate, time to maturity and bond valuation.
7. What do you mean by constant growth in dividend? How does growth factor affects the value of the share?
8. What are different approaches to valuation of an equity share? Which of these has the strongest theoretical roots?
9. What is the relationship between earnings and value of a share?
10. Examine the relevance of dividend in valuation of equity shares. How would you value the shares of a company that does not pay any dividend?

PROBLEMS

P17.1 A company has a book value per share of ₹ 137.80. Its return on equity is 15% and it follows a policy of retaining 60% of its earnings. If the opportunity cost of capital is 18%, what would be the price of the share today?

[*Answer :* g = 9%, and P_0 = 91.90.]

P17.2 A mining company's iron ore reserves are being depleted, and its cost of recovering a declining quantity of iron ore are raising each year. As a sequel to it, the company's earnings and dividends are declining, at a rate of 8% per year. If the previous year's dividend (D_0) was ₹ 10 and the required rate of return is 15%, what would be the current price of the equity share of the company?

[*Answer :* Price = ₹ 40.]

P17.3 The current price of a company share is ₹ 70. The company is expected to pay a dividend of ₹ 4.20 per share increasing with an annual growth rate of 5%. If an investor's required rate of return is 10%, should he buy the share?

[*Answer :* k_e is 11%, the share may be purchased.]

P17.4 ABC Company had sold 1,000 12% perpetual debentures 10 years ago. Interest rates have risen since then, so that, debentures of this company are now selling at 15% yield basis.

(*i*) Determine the current indicated/expected market price of the debentures. Would you buy the debentures for ₹ 700?

(*ii*) Assume that the debentures of the company are selling at ₹ 825. If the debentures have 8 years to run to maturity, compute the approximate effective yield an investor would earn on his investment?

[*Answer :* Expected Market Price is ₹ 800. Effective Yield is approx. 16%.]

P17.5 A company is currently paying a dividend of ₹ 2.00 per share. The dividend is expected to grow at a 15% annual rate for three years, then at 10% rate for the next three years, after which it is expected to grow at a 5% rate forever, (*a*) What is the present value of the share if the capitalization rate is 9%?

[*Answer :* $P_0 = 77.20$.]

P17.6 A large-sized chemical company has been expected to grow at 14% per year for the next 4 years and then to grow indefinitely at the rate 5%. The required rate of return on the equity shares is 12%. Assume that the company paid a dividend of ₹ 2 per share last year ($D_0 = 2$). Determine the market price of the shares today.

[*Answer :* Price = ₹ 40.62.]

P17.7 A chemical company has been growing at a rate of 18% per year in recent years. This abnormal growth is expected to continue for another 4 years; then it is likely to grow at the normal rate (g_n) of 6%. The required rate of return on the shares of the investment community is 12%, and the dividend paid per share last year was ₹ 3 ($D_0 = ₹ 3$). At what price, would you, as an investor, be ready to buy the shares of this company now (t = 0), and at the end of the years 1, 2, 3, 4 respectively? Will there be any extra advantage by buying shares at t = 0, on in any of the subsequent four years, assuming all other things remain unchanged?

[*Answer :* P_4 is ₹ 102.82, P_0 ₹ 79.12 *i.e.*, P_4 + PV of D_1 to D_4. Similarly, P_1 = ₹ 85 approx, P_2 = ₹ 91 approx and P_3 = ₹ 97 approx. No extra advantage of buying shares at these price.]

P17.8 XYZ Ltd. recently paid a dividend of ₹ 2.00 per share and it is a fairly risky company with a cost of equity of 25%. A summary of dividends and earnings per share is given below:

	Dividends	**Earnings**
2015	₹ 2.00	₹ 4.50
2014	1.80	3.50
2013	1.70	4.00
2012	1.40	3.00
2011	1.30	2.50

Any new investment by XYZ Ltd. is expected to yield a return comparable to the cost of equity. Show two methods of estimating, *g*, from the above data and use each of these to calculate a share price for XYZ Ltd.

[*Answer :* Based on Dividends: g = 11.4%, P_0 = ₹ 16.38. Based on retained earnings: g = br = 14%, P_0 = ₹ 20.72]

Appendices

APPENDIX I : FINANCIAL DECISION MAKING WITH EXCEL

APPENDIX II : SUGGESTED ANSWERS TO PRACTICAL QUESTIONS IN QUESTION PAPER OF FINANCIAL MANAGEMENT, B.COM.(H.), UNIVERSITY OF DELHI.

APPENDIX III : MATHEMATICAL TABLES

FINANCIAL DECISION MAKING WITH EXCEL

In this text book so far, all calculations have been made manually. However, all the time calculations may not be so simple. There are numerous decisions situations when the calculations become tedious and complicated. In such cases, the spreadsheet of the MICROSOFT OFFICE can be used to do the calculations that simplify decision making process. Present Appendix attempts to explain the use of EXCEL sheet in a variety of situations. Apart from formula building, there are several built-in functions available that can be used for specific calculations in the areas of accounting, finance, statistics, mathematics, *etc.* Some of these are as follows:

(1) **DURATION** : Returns the Annual duration of a security with periodic interest payments.

(2) **EFFECT** : Returns the annual effective interest rate.

(3) **FV** : Returns the future value of an investment based on periodic constant payment and a constant interest rate.

(4) **FV SCHEDULE** : Returns the future value of an initial principal after applying a series of compound interest rate.

(5) **INTRATE** : Returns the interest rate for a fully invested security.

(6) **IRR** : Returns the internal rate of return for a series of cash flows.

(7) **MDURATION** : Returns the Macauley modified duration for a security with an assumed par value of $100.

(8) **MIRR** : Returns the internal rate of return for a series of periodic cash flows considering both cost of investment and interest on reinvestment of cash.

(9) **NOMINAL** : Returns the annual nominal interest rate.

(10) **NPV**: Returns the net present value of an investment based on a discount rate and a series of future payments (negative values) and incomes (positive values).

(11) **PV** : Returns the present value of an investment *i.e.*, the total amount that a series of future payments is worth now.

(12) **XIRR** : Returns the internal rate of return for a series of cash flows.

(13) **XNPV**: Returns the net present value for a series of cash flows.

(14) **YIELD**: Returns the yield on a security that pays periodic interest.

I. APPLICATION IN TIME VALUE OF MONEY

Most of the financial decisions involve the use of concept of time value of money. Be it capital budgeting, cost of capital, valuation of assets, *etc.*, cash flows arising at different points of time are compared before taking the decisions. In order to compare the cash flows arising at different points of time, the concepts of present value and future value are applied. Concepts of Present Value (PV Function) and Future Value (FV Function) are used in finance for making the cash flows occurring at different points of time comparable either:

- By discounting the future cash flow to present day, or
- By compounding the present money to a future date.

The techniques of discounting and compounding as a tool to incorporate TVM in financial decision making through EXCEL sheet are explained hereunder.

Present Value can be calculated in two different cases:

(*i*) PV of a future sum, and

(*ii*) PV of a future series.

Use of EXCEL spread sheet in such cases can be explained as follows:

PV of a Future Sum

Example A.1

X sells goods of ₹ 1,500 on a credit of three years. Opportunity cost is 10%. Present value of ₹ 1,500 @10% may be found with help of Equation 2.2A as follows:

$$PV = ₹\,1{,}500 \times PVF_{(10,3)}$$
$$= ₹\,1{,}500 \times .751 = ₹\,1126.50$$

EXCEL sheet can be used to present it as follows:

MS OFFICE : EXCEL Application PV : Returns the Present Value of a single future cash flow
PV (RATE, NPER, PMT, FV, TYPE)
This built-in function can be used to find out the present value of a future cash flow, accruing after a certain period, at a given rate of discount. The independent variables used in PV function are : Rate = Rate of discount (interest) per period NPER = No. of periods FV = Future value PMT = Used in Annuities and in single future cash flow TYPE = set to zero.

PV : Present Value of a Single Future Cash Flow

	A	B	C	D
1.	Future Value (₹)			1,500
2.	Years (NPER)			3
3.	Rate (%)			10
4.	Present Value (PV)			1126.50
5.				
6.				
7.	= PV (RATE, NPER, PMT, FV, TYPE)			
8.	= PV (D3, D2, 0, –D1, 0)			
9.				
10.				
11.	The result obtained as above is same as given by EXCEL function.			
12.				
13.				

PV of a series of Equal Future Cash Flows

Example A.2

X sells goods for which he offers following option of payment: (i) Pay ₹ 2,500 now, or (ii) Pay ₹ 900 each at the end of first year, second year and third year from now. The customer having opportunity cost of 10% can choose between these options by comparing PV of series of ₹ 900 with ₹ 2,500 using Equation 2.2B.

PV $= ₹\ 900 \times PVAF_{(10,3)}$

$= ₹\ 900 \times 2.487$ $= ₹\ 2,238$

EXCEL sheet can be used to present this case as follows:

MS OFFICE : EXCEL Application

PV : Returns the present value of a Future Annuity

PV (RATE, NPER, PMT, FV, TYPE)

This built-in function (used in preceding exhibit) can also be used for finding out the total present value of the series of annuity of a given amount, at a given discount rate. The independent variables are same as used earlier, but :

PMT = Future Payment (Annuity Amount)

TYPE = 0 for payment at the end of the period

PV : Present value of a Future Annuity

	A	B	C	D
1.	Future Value (₹)			0
2.	Years (NPER)			3
3.	Rate (%)			10
4.	PMT			900
5.	Present Value (PV)			2,238
6.				
7.	= PV (RATE, NPER, PMT, FV, TYPE)			
8.	= PV (D3, D2, –D4, 0, 0)			
9.				
10.				
11.	The result obtained as above is same as given by EXCEL function.			
12.				
13.				
14.				

PV of an Annuity Due

Example A.3

A recurring amount of ₹ 1,000 is receivable in the beginning of each of 4 years starting from now @ 6%. The PV can be found with the help of Equation 2.7 as follows:

PV $= ₹\ 1,000 \times PVAF_{(6\%,4)}(1 + .06)$

$= ₹\ 1,000 \times 3.465\ (1 + .06)$ $= ₹\ 3,673$

MS OFFICE : EXCEL Application

PV : Returns the total present value of an annuity due.

The built in function PV can also be used to find out the future value or present value of an annuity due by appropriately setting the value of TYPE to 1.

PV : Present Value of an Annuity Due

	A	B	C	D
1.	Present Value (₹)			—
2.	Payment (PMT)		100	1000
3.	Rate (%)		6	6
4.	Years (NPER)		4	4
5.				
6.	Present Value (₹)		—	3,673
7.				
8.				
9.				
10.	= PV (RATE, NPER, PMT, TYPE)			
11.	= PV (D3, D4, D1, 1)			
12.				
13.	The result obtained as above is same as given by EXCEL function.			
14.				

PV of a Perpetuity

Example A.4

A bank makes an offer to deposit with it a sum of ₹ 16,000 and then receive a return of ₹ 1,800 p. a. perpetually. Should the offer be accepted by an investor whose opportunity rate of return is 12%? Will the decision change if his rate of return is 10%?

In this case, the PV of the perpetuity can be found as follows:

PV $= ₹\ 1,800 \div .12$ $= ₹\ 15,000$

EXCEL sheet can be used as follows:

	A	B	C	D
1		₹		₹
2	Current Deposit	16000		
3	Annual Return (perpetuity)	1800	PV of Cash flows if Opportunity Cost is 12%	=B3/B4
4	Opportunity Cost (i)	0.12	PV of Cash flows if Opportunity Cost is 10%	=B3/B5
5	Opportunity Cost (ii)	0.10		

	A	B	C	D
6				
7				
8	PV of Cash flows if Opportunity Cost is 12%		15000	
9	PV of Cash flows if Opportunity Cost is 10%		18000	
10				
11				
12				

If the opportunity cost is 10%, PV = ₹ 1,800/0.10
= ₹ 18,000

So, at the opportunity cost of 12%, the bank offer need not be accepted. However, at 10%, the offer can be accepted.

PV of a series of Unequal Future Cash Flows

The PV function of Excel can be used to find out the present value of a stream of cash flows only if the cash flows are equal. If the cash flows are unequal the PV can be computed using NPV function. NPV function never computes Net Present Value. It is used to compute the PV of unequal cash flows.

Example A.5

Continuing with Example A.2, what happens if the future payments are ₹ 800, ₹ 900 and ₹ 1,000.

In this case, the PV can be found as follows:

$$PV = ₹\ 800 \times PVF_{(10,1)} + ₹\ 900 \times PVF_{(10,2)} + ₹\ 1,000 \times PVF_{(10,3)}$$
$$= ₹\ 2146.50$$

This can be presented in EXCEL sheet as follows:

	A	B	C	D	E
1	Year	Cash Flows (Rs.)	Discount rate	10%	
2	1	800			
3	2	900			
4	3	1000			
5	Present Value	=NPV(D1,B2:B4)			
6					
7					
8					
9					
10					

Present Value ₹2,222.39

Before using NPV Function, the cash flows are to be arranged in order of their occurrences. Cash outflow is shown as a negative figure. For example, for first two years there is cash inflow and in the third year there is outflow. Then, the first two rows of any column will have cash inflows and the third row will record the amount of outflow as a negative figure. It is important to note that NPV Function assumes that the first cash flow occurs at the end of the year.

The **Compounding Technique** is used to find out the future value of a present money and can be explained as follows:

FV of a single Present Cash Flow:

Example A.6

An investor is interested to find out the future value of ₹ 5,000 invested today for 10 years @5% rate. As per Equation 2.1A, FV is:

$$FV = ₹\ 5,000 \times CVF_{(5\%,10)}$$
$$= ₹\ 5,000 \times 1.629 = ₹\ 8,145$$

In EXCEL sheet, the same can be shown as follows:

MS OFFICE : EXCEL Application

FV : Returns the future value of Single Cash Flow

FV(RATE, NPER, PMT, PV, TYPE)

This built-in function can be used to find out the future (compounded) value of a single cash flow, occurring today, at a given rate of interest, after a given period and compounded every desired time interval. The independent variables used in FV function are :

Rate = Rate of interest per period
NPER = No. of Periods
PV = Present Value
PMT =] Used in Annuities and in single cash flow are
TYPE =] set to zero.

FV : Future Value of a Single Cash Flow

	A	B	C	D
1.	Present Value (PV)			5,000
2.	Years (NPER)			10
3.	Rate (%)			5
4.	Future Value (FV)			8,145
5.				
6.				
7.	= FV (RATE, NPER, PMT, PV, TYPE)			
8.	= FV (D3, D2, 0, –D1, 0)			
9.				
10.	The result obtained as above is same as given by EXCEL function.			
11.				
12.				

FV of a series of Equal Annual Cash Flows:

Example A.7

An investor deposits ₹ 10,000 at the end of each of next 10 years from today. He wants to find out his total accumulation, given rate of interest at 10%. This can be presented as:

$$FV = ₹\ 10,000 \times CVAF_{(10\%,10)}$$
$$= ₹\ 10,000 \times 15.937 = ₹\ 1,59,370$$

Same can be presented in EXCEL Table as follows:

MS OFFICE : EXCEL Application

FV : Returns the future value of an Annuity

FV (RATE, NPER, PMT, PV, TYPE)

This built-in function can also be used for finding out the total compounded value of an annuity of a given amount, at a given rate, after a given period. The independent variables are same as used earlier, but

PMT = Payment (Annuity Amount)
TYPE = D for payment at the end of the period.

FV : Future Value of an Annuity

	A	B	C	D
1.	Present Value (PV)			0
2.	Payment (PMT)			10,000
3.	Rate (%)			10
4.	Years (NPER)			10
5.	Future Value (FV)			1,59,370
6.				
7.	= FV (RATE, NPER, PMT, PV, TYPE)			
8.	= FV (D3, D4, –D2, 0, 0)			

FV of an Annuity Due

Example A.8

A recurring deposit of ₹ 100 is made in the beginning of each of next 4 years starting from now @ 6%. What will be total deposit at the end of 4 years? This can be found as follows:

FV = ₹ 100 × $CVAF_{(6\%,4)}$ × (1 × .06)
= ₹ 100 × 4.375 = ₹ 463.75

This can be presented in EXCEL Sheet as follows:

FV : Future Value of an Annuity Due

	A	B	C
1.	Present Value (₹)		
2.	Payment (PMT)		100
3.	Rate (%)		6
4.	Years (NPER)		4
5.	Future Value (₹)		463.75
6.			—
7.	= FV (RATE, NPER, PMT, PV, TYPE)		
8.	= FV (C3, C4, C1, 0, 1)		
9.			
10.			
11.	The results obtained as above is same as given by EXCEL function.		
12.			
13.			
14.			

Finding out the Implicit Rate of Interest

A finance company may offer a scheme under which an investor is required to deposit a specific amount now and to receive a specific amount at the end of a particular period. Investor's decision in this case will depend on the implicit rate of return of this deposit.

Example A.9

A Deep Discount Bond is issued for ₹ 5,000 today and will mature after 15 years for ₹ 18,000. Advise an investor whose opportunity rate of return is 11%?

Such a problem can be solved with the help of IRR function of EXCEL.IRR function requires information about sequence of cash flows. A cash outflow is shown as a negative cash flow. Since in the above problem, only one cash inflow is there, interim cash flows between 1st and 14th year are all shown as "0". Now, the case can be presented as follows:

	A	B	C	D	E
1				Year	Cash Flow
2	Bond's Issue price today (Rs.)	5000		0	-5000
3	Redemption Value (Rs.)	18000		1	0
4	Tenure (Years)	15		2	0
5				3	0
6				4	0
7				5	0
8				6	0
9				7	0
10				8	0
11				9	0
12				10	0
13				11	0
14				12	0
15				13	0
16	Rate of return 8.91%			14	0
17				15	18000
18				Rate	=IRR(E2:E1
19					

It can be verified that ₹ 5,000 × (1+8.91%)^15 = ₹ 18,000.

Accumulating a Target Amount in Equal Annual Instalments over a given period

Example A.10

How much amount should be invested each of next 5 years @10% to accumulate ₹ 1,00,000 at the end of that period? With the help of Equation 2.10, the annual amount can be found as follows :

Annuity Amount = FV ÷ $CVAF_{(10,5)}$
= ₹ 1,00,000 ÷ 6.105 = ₹ 16,380

The EXCEL sheet can be used as follows:

Calculation of CVAF:

	A	B	C	D
1	Calculation of annuity amount			
2	Rate	10%	Fututre Cash Flow (Rs.)	100000
3	Time	5	Annuity Amount	
4	CVAF	=FV(B2,B3,-1		
5		FV(rate, nper, **pmt**, [pv], [type])		
6				

Calculation of Annuity Amount:

	A	B	C	D
1	Calculation of annuity amount			
2	Rate	10%	Fututre Cash Flow (Rs.)	100000
3	Time	5	Annuity Amount	=D2/B4
4	CVAF	₹6.105		
5				
6		Annuity Amount	₹16,379.75	
7				
8				
9				

Loan Repayment Schedule

Sometimes, one may be interested to find out equal annual amount that should be paid to redeem a loan together with interest over a given period.

Example A.11

A person borrows ₹ 1,00,000 today to be repaid in equal annual instalments at the end of each of next five years in such a way that the interest at the rate 10% p.a. is also paid. In this case, the annuity amount can be found as follows:

Annuity Amount = PV ÷ $PVAF_{(10,5)}$

= ₹ 1,00,000 ÷ 3.791 = ₹ 26,378

Calculation of PVAF :

	A	B	C	D
1	Calculation of annuity amount			
2	Rate	10%	Fututre Cash Flow (Rs.)	100000
3	Time	5	Annuity Amount	
4	PVAF	=PV(B2,B3,-1)		
5		PV(rate, nper, **pmt**, [fv], [type])		
6				
7				

Calculation of Annuity Amount:

	A	B	C	D
1	Calculation of annuity amount			
2	Rate	10%	Fututre Cash Flow (Rs.)	100000
3	Time	5	Annuity Amount	=D2/B4
4	PVAF	₹3.791		
5				
6				
7		Annuity Amount	₹26,379.75	
8				

II. APPLICATION IN CAPITAL BUDGETING

EXCEL sheet can be constructively used in capital budgeting for analyzing any project and calculation of any parameter such as Payback, ARR, NPV, PI, IRR, MIRR, *etc.*

Example A.12

A machine is available for ₹ 1,70,000 and having life of 5 years. It is expected to generate cash flows of ₹ 20,000, ₹ 50,000, ₹ 60,000, ₹ 40,000, and ₹ 75,000. Find out the NPV of the machine given the required rate of return as 10%.

EXCEL sheet can be used to present it as follows:

MS OFFICE : EXCEL Application

NPV : Returns the Net Present Value of an investment based on a series of periodic cash flows and a discount rate.

NPV (Rate, Value 1, Value 2,.....)

The built in function NPV helps in calculating the NPV of a Capital budgeting proposal. The function requires data of cash flows and the required rate of return *i.e.*, the discount rate. The independent variables used in the function are:

Rate : Rate is the discount rate over one period

Values ..... : Values of which NPV is to be calculated must be equally placed in time

NPV : Net Present Value of a Capital Budgeting proposal

	A	B	C	D
1	Year			**Cash Flows**
2	0			–1,70,000
3	1			20,000
4	2			50,000
5	3			60,000
6	4			40,000
7	5			75,000
8		Net Present Value		8,435
9				
10		= NPV (Rate, Values)		
		= NPV (0.10, D3 :D7) + D2		

Example A.13 (Annual Cash Flows):

A firm is evaluating a proposal costing ₹ 1,60,000 and expected to generate cash flows of ₹ 40,000, ₹ 60,000, ₹ 50,000, ₹ 50,000, and ₹ 40,000. There is no salvage value thereafter. Find out the IRR of the proposal. Should it be taken up if the hurdle rate of the firm is 12%?

This can be presented in EXCEL sheet as follows:

MS OFFICE : EXCEL Application

IRR : Returns the Internal Rate of Return of the series of cash flows

IRR (Values)

The built-in function IRR helps in calculating the internal rate of return of a capital budgeting proposal based on the relevant cash flows occurring at an annual interval. These cash flows need not be equal but must be at regular annual interval. The independent variables used in the formula are:

Values : The sequence of cash flows must contain one negative and one positive value.

IRR : Calculation of Internal Rate of Return of a Capital Budgeting Proposal				
	A	B	C	D
1	Year			**Cash Flows**
2	0			–1,60,000
3	1			40,000
4	2			60,000
5	3			50,000
6	4			50,000
7	5			40,000
8	Internal Rate of Return			
9				15.40%
10	= IRR (Values)			
11	= IRR (D2 : D7)			
12				

Example A.14

XYZ Ltd. is having two proposals A and B, out of which one is to be selected. Necessary information for these projects is given hereunder.

		Project A (₹)	**Project B (₹)**
Cost of Project		6,00,000	8,00,000
Cash Flows	Year 1	2,00,000	2,40,000
	Year 2	2,00,000	2,90,000
	Year 3	2,50,000	3,50,000
	Year 4	3,00,000	4,00,000
	Year 5	3,50,000	4,50,000
Required Rate of Return		14%	14%

The given information can be presented in an EXCEL sheet as follows:

Calculation of Present Value:

	A	B	C	D
1			**Project A (₹)**	**Project B (₹)**
2	Cost of Project		600000	800000
3	Cash Flows	Year 1	200000	240000
4		Year 2	200000	290000
5		Year 2	250000	350000
6		Year 4	300000	400000
7		Year 5	350000	450000
8	Required Rate of Return		14%	14%
9	Present Value	=NPV(C8, C3:C7)		
10		NPV(rate,**value1**,[value2],[value3],…)		

Calculation of NPV:

	A	B	C	D	E	F	G	H
1			**Project A (₹)**	**Project B (₹)**		**Parameters of Capital Budgeting**		
2	Cost of Project		600000	800000			**Project A**	**Project B**
3	Cash Flows	Year 1	200000	240000	1	NPV	=C9–C2	
4		Year 2	200000	290000				
5		Year 3	250000	350000				
6		Year 4	300000	400000				
7		Year 5	350000	450000				
8	Required Rate of Return		14%	14%				
9	Present Value		₹ 857,478.10					

Calculation of IRR:

	A	B	C	D	E	F	G	H
1			**Project A (₹)**	**Project B (₹)**		**Parameters of Capital Budgeting**		
2	Cost of Project		–600000	–800000			**Project A**	**Project B**
3	Cash Flows	Year 1	200000	240000	1	NPV	₹ 257,478.10	
4		Year 2	200000	290000	2	IRR	=IRR(C2:C7)	
5		Year 3	250000	350000			IRR(**values**, [guess])	
6		Year 4	300000	400000				
7		Year 5	350000	450000				
8	Required Rate of Return		14%	14%				
9	Present Value		₹ 857,478.10					

Calculation of Profitability Index:

	A	B	C	D	E	F	G	H
1			**Project A (₹)**	**Project B (₹)**		**Parameters of Capital Budgeting**		
2	Cost of Project		–600000	–800000			**Project A**	**Project B**
3	Cash Flows	Year 1	200000	240000	1	NPV	₹ 257,478.10	
4		Year 2	200000	290000	2	IRR	28.85%	
5		Year 3	250000	350000	3	PI	=C9/(–C2)|	
6		Year 4	300000	400000				
7		Year 5	350000	450000				
8	Required Rate of Return		14%	14%				
9	Present Value		₹ 857,478.10					

Calculation of different parameters for both projects (Final Output):

	A	B	C	D	E	F	G	H
1			**Project A (₹)**	**Project B (₹)**		**Parameters of Capital Budgeting**		
2	Cost of Project		–600000	–800000			**Project A**	**Project B**
3	Cash Flows	Year 1	200000	240000	1	NPV	₹ 257,478.10	₹ 340,459.94
4		Year 2	200000	290000	2	IRR	28.85%	28.64%
5		Year 3	250000	350000	3	PI	1.429	1.426
6		Year 4	300000	400000				
7		Year 5	350000	450000				
8	Required Rate of Return		14%	14%				
9	Present Value		₹ 857,478.10	₹ 1,140,459.94				

Example A.15 (Non-periodic Cash Flows) :

Find out the IRR of the following proposal having non-annual cash flows:

	Cash Flows(₹)		**Date**
1	–20,000		Jan. 1,2017
2	5,500		March 1,2017
3	8,500		Nov. 1,2017
4	6,500		Feb. 15,2018
5	5,500		April 1,2018

This can be presented in EXCEL sheet as follows:

MS OFFICE : EXCEL Application

XIRR : Returns the internal rate of return of a series of cash flows that are not periodic.

XNPV : Returns the NPV of a series of cash flows that are not periodic

XIRR (Values, Dates)

XNPV (Rate, Values, Dates)

The built in function, XIRR, helps in calculation of internal rate of return of a series of cash flows that are not occurring periodically the values and dates must correspond to each other. The first value is the outflow and is negative. Dates are entered in the format (year, month, date). The independent variables used are:

Values : Different cash flows with negative/positive signs

Rate : Rate of discount for NPV

Dates : Dates of occurrence of values in the same sequence. To be given in formal (yy,mm,dd)

XIRR : Internal Rate of Return of a series not occurring periodically

	A	B	C	D
1	Values	Occurrence		Date
2	–20,000	Jan., 1, 2017		2017, 1,1
3	5,500	March 1, 2017		2017, 3, 1
4	8,500	Oct., 30, 2017		2017, 10, 30
5	6,500	Feb. 15, 2018		2018, 2, 15
6	5,500	April 1, 2018		2018, 4, 1
7		Internal Rate of Return		37.34%
8				
9				
10		= XIRR (Values Rates)		
11		= XIRR (A2:A6, D2:D6)		
12		Net Present Value		₹ 2086.65
13				
14		= XNPV (Rate, Values, Dates)		
		= XNPV (0.09, A2:A6, D2:D6)		

Example A.16

ITC Ltd. has decided to purchase a machine to augment the company's installed capacity to meet the growing demand for its products. There are three machines under consideration of the management. The relevant details including estimated yearly expenditure and sales are given below. All sales are on cash. Corporate Income Tax rate is 30%.

	Machine 1	Machine 2	Machine 3
Initial Investment required	₹ 3,00,000	₹ 3,00,000	₹ 3,00,000
Estimated Annual Sales	5,00,000	4,00,000	4,50,000
Cost of Production (estimated):			
Direct Materials	40,000	50,000	48,000
Direct Labour	50,000	30,000	36,000
Factory Overheads	60,000	50,000	58,000
Administration costs	20,000	10,000	15,000
Selling and distribution costs	10,000	10,000	10,000

The economic life of Machine 1 is 2 years, while it is 3 years for the other two. The scrap values are ₹ 40,000, ₹ 25,000, and ₹ 30,000 respectively. You are required to find out the most profitable investment based on 'Pay Back Method'.

This case can be presented as follows: (Modelling)

A		B	C	D
1		**Calculation of Pay Back Period**		
2	**Details**	**Machine 1**	**Machine 2**	**Machine 3**
3	Initial Investment required (₹)	300000	300000	300000
4	Estimated Annual Sales (₹)	500000	400000	450000
5	**Estimated Cost of production**			
6	Direct Material	40000	50000	48000
7	Direct Labour	50000	30000	36000
8	Factory Overheads	60000	50000	58000
9	Administration Cost	20000	10000	15000
10	Selling and Distribution Cost	10000	10000	10000
11	Depreciation	=ROUND((B3-B15)/B14,0)	=ROUND((C3-C15)/C14,0)	=ROUND((D3-D15)/D14,0)
12	Total Cost of Production	=SUM(B6:B11)	=Sum(C6:C11)	=Sum(D6:D11)
13	**Other Information**			
14	Economic life	2	3	3
15	Scrap Values	40000	25000	30000
16	Corporate Tax rate	0.30		
17	Cash Inflows After Tax	=ROUND((B4-B12)*(1–$B$16)+B11,0)	=ROUND((C4-C12)*(1–$C$16)+C11,0)	=ROUND((D4-D12)*(1–$D$16)+D11,0)
18	**Pay Back Period**	**=ROUND(B3/B17,3)**	**=ROUND(C3/C17,3)**	**=ROUND(D3/D17,3)**

Output of the case:

A		B	C	D
1	**Calculation of Pay Back Period**			
2	**Details**	**Machine 1**	**Machine 2**	**Machine 3**
3	Initial Investment required (₹)	300000	300000	300000
4	Estimated Annual Sales (₹)	500000	400000	450000
5	**Estimated Cost of Production**			
6	Direct Material	40000	50000	48000
7	Direct Labour	50000	30000	36000
8	Factory Overheads	60000	50000	58000
9	Administration Cost	20000	10000	15000
10	Selling and Distribution Cost	10000	10000	10000
11	Depreciation	130000	91667	90000
12	Total Cost of Production	310000	241667	257000
13	**Other Information**			
14	Economic life	2	3	3
15	Scrap Values	40000	25000	30000
16	Corporate Tax rate	30%		
17	Cash inflows After Tax	263000	202500	225100
18	**Pay Back Period**	**1.141**	**1.481**	**1.333**

Machine 1 has the lowest payback period, so it may be preferred over other two machines.

Example A.17

Machine A costs ₹ 1,00,000 payable immediately. Machine B costs ₹ 1,20,000 half payable immediately and half payable in one year's time. The cash receipts expected are as follows:

Year (at end)	Machine A	Machine B
1	₹ 20,000	—
2	60,000	₹ 60,000
3	40,000	60,000
4	30,000	80,000
5	20,000	—

At 7% opportunity cost, which machine should be selected on the basis of NPV?

This case can be presented as follows: (Modelling)

	A	B	C
1	**Calculation of NPV**		
2	**Opportunity Cost of Capital**		**0.07**
3	**Year**	**Machine A (₹)**	**Machine B (₹)**
4	0	–100000	–60000
5	1	20000	–60000
6	2	60000	60000
7	3	40000	60000
8	4	30000	80000
9	5	20000	-
10	**NPV**	**=NPV($B$2, B5: B9)+B4**	**=NPV($B$2, C5: C9)+C4**
11	**Which Project is Better?**	**=IF(B10>C10, "Machine A","Machine B")**	

Output of the above table :

	A	B	C
1	**Calculation of NPV**		
2	**Opportunity Cost of Capital**	**7%**	
3	**Year**	**Machine A**	**Machine B**
4	0	–100000	–60000
5	1	20000	–60000
6	2	60000	60000
7	3	40000	60000
8	4	30000	80000
9	5	20000	-
10	**NPV**	**₹ 40,896.41**	**₹ 46,341.05**
11	**Which Project is Better?**	**Machine B**	

Machine B having higher NPV may be selected.

Example A.18

XYZ Ltd. is considering two additional mutually exclusive projects. The after-tax cash flows associated with these projects are as follows:

Year	Project A	Project B
0	₹ 1,00,000	₹ 1,00,000
1	32,000	0
2	32,000	0
3	32,000	0
4	32,000	0
5	32,000	₹ 2,00,000

The required rate of return on these projects is 11% :

(*a*) What is each project's Net Present Value?

(*b*) What is each project's Internal Rate of Return?

(*c*) What has caused the ranking conflict?

(*d*) Which project should be accepted? Why?

The above case can be presented as follows: (Modelling)

	A	B	C
1	**Calculation of NPV and IRR**		
2	**Opportunity Cost of Capital**		**0.11**
3	**Year**	**Project A**	**Project B**
4	0	–100000	–100000
5	1	32000	0
6	2	32000	0
7	3	32000	0
8	4	32000	0
9	5	32000	200000
10	**NPV**	**=NPV($B$2, B5:B9)+B4**	**=NPV($B$2, C5:C9)+C4**
11	**IRR**	**=IRR(B4:B9)**	**=IRR(C4:C9)**

Output of the above table:

	A	B	C
1	**Calculation of NPV and IRR**		
2	**Opportunity Cost of Capital**	**11%**	
3	**Year**	**Project A**	**Project B**
4	0	–100000	–100000
5	1	32000	0
6	2	32000	0
7	3	32000	0
8	4	32000	0
9	5	32000	200000
10	**NPV**	**₹ 18,268.70**	**₹ 18,690,27**
11	**IRR**	**18.03%**	**14.87%**

According to NPV method, Project B is better while the IRR method suggests for Project A. Difference in ranking of projects arises because of difference in patterns of inflows. However still, the firm may prefer Project A, the

reason being that the NPV of two projects are not much different but IRR of Project A is definitely higher than that of Project B.

Example A 19

A company requires an initial investment of ₹ 40,000. The estimated net cash flow are as follows:

(Figures in ₹)

Year	1	2	3	4	5	6	7	8	9	10
Net cash flow	7,000	7,000	7,000	7,000	7,000	8,000	10,000	15,000	10,000	4,000

Using 10% as the cost of capital (rate of discount), determine the following :

(*i*) Pay-back period (*ii*) Net Present Value and (*iii*) Internal Rate of Return.

The above case can be presented as follows:

	A	B	C
1	**Calculation of NPV and IRR**		
2	**Opportunity Cost of Capital**		**0.1**
3	**Year**	**Project's Cash flows (₹)**	**Cumulative Cash flows (₹)**
4	0	–40000	
5	1	7000	=B5
6	2	7000	=B6+C5
7	3	7000	=B7+C6
8	4	7000	=B8+C7
9	5	7000	=B9+C8
10	6	8000	=B10+C9
11	7	10000	=B11+C10
12	8	15000	=B12+C11
13	9	10000	=B13+C12
14	10	4000	=B14+C13
15	**Payback Period**	**=5+(40000-35000)/8000**	
16	**NPV**	**=NPV(B2,B5:B14)-(-B4)**	
17	**IRR**	**=IRR(B4:B14)**	

The output of the above table is as follows:

	A	B	C
1	**Calculation of NPV and IRR**		
2	**Opportunity Cost of Capital**		**10%**
3	**Year**	**Project's Cash flows (₹)**	**Cumulative Cash flows (₹)**
4	0	–40000	
5	1	7000	7000
6	2	7000	14000
7	3	7000	21000
8	4	7000	28000
9	5	7000	35000
10	6	8000	43000
11	7	10000	53000
12	8	15000	68000
13	9	10000	78000
14	10	4000	82000
15	**Payback Period**	**5,625**	
16	**NPV**	**₹ 8,963,64**	
17	**IRR**	**14.64%**	

III. APPLICATION IN FINANCING DECISIONS :

Example A.20

PQR & Co. has the following capital structure as on Dec. 31.

Equity Share Capital (5000 shares of ₹ 100 each)	₹ 5,00,000
9% Preference Shares	₹ 2,00,000
10% Debentures	₹ 3,00,000

The equity shares of the company are quoted at ₹ 102 and the company is expected to declare a dividend of ₹ 9 per share for the next year. The company has registered a dividend growth rate of 5% which is expected to be maintained.

(*i*) Assuming the tax rate applicable to the company at 30%, calculate the weighted average cost of capital, and

(*ii*) Assuming that the company can raise additional term loan at 12% for ₹ 5,00,000 to finance its expansion, calculate the revised WACC. The company's expectation is that the business risk associated with new financing may bring down the market price from ₹ 102 to ₹ 96 per share.

The information given in the above case can be summarized as follows:

	A	B	C	D	E	F	G
1	**Capital Structure**						
2	**Source**	**No. of units**	**Price**	**Amount**	**Cost of Capital**	**Weight**	**Weighted Cost**
3	Equity Shares	5000	100	=B3*C3	=B11/B10+B12	=D3/$D$6	=E3*F3
4	9% preference Shares			200000	=B14	=D4/$D$6	=E4*F4
5	10% Debentures			300000	=B13*(1–B9)	=D5/$D$6	=E5*F5
6	Total			=SUM(D3:D5)		=SUM(F3:F5)	=SUM(G3:G5)
7							
8	**Additional Information**						
9	Tax Rate	0.3					
10	Market price of Equity shares	102					

	A	B	C	D	E	F	G
11	Expected dividend	₹ 9.00					
12	Dividend growth rate	0.05					
13	Interest rate	0.10					
14	Preference dividend rate	0.09					

Output of the above table is as follows:

	A	B	C	D	E	F	G
1	**Capital Structure**						
2	**Source**	**No. of units**	**Price**	**Amount**	**Cost of Capital**	**Weight**	**Weighted Cost**
3	Equity Shares	5000	₹ 100.00	₹ 500,000	13.82%	0.5	6.91%
4	9% preference Shares			₹ 200,000	9.00%	0.2	1.80%
5	10% Debentures			₹ 300,000	7.00%	0.3	2.10%
6	Total			₹ 1,000,000		1	10.81%
7							
8	**Additional information**						
9	Tax Rate	30%					
10	Market price of Equity shares	102					
11	Expected dividend	₹ 9.00					
12	Dividend growth rate	5%					
13	Interest rate	10%					
14	Preference dividend rate	9%					

The advantage of using spreadsheet is that you just need to make changes or additions in the existing structure and the desired output will automatically be obtained by spreadsheet. In the present case, there is a need to add one more source of capital and calculate its corresponding cost of capital. Rest the sheet will take care of. In case, the firm decides to raise a loan of ₹ 5,00,000, the modelling of the case and the output can be presented as follows:

	A	B	C	D	E	F	G
1	**Capital Structure**						
2	**Source**	**No. of units**	**Price**	**Amount**	**Cost of Capital**	**Weight**	**Weighted Cost**
3	Equity Shares	5000	100	=83*C3	=B12/B11+B13	=D3/$D$7	=E3*F3
4	9% Preference Shares			200000	=B15	=D4/$D$7	=E4*F4
5	10% Debentures			300000	=B14*(1–B10)	=D5/$D$7	=E5*F5
6	12% Term Loan			500000	=B16*(1–B10)	=D6/$D$7	=E6*F6
7	Total			=SUM(D3:D6)		=SUM(F3:F6)	=SUM(G3:G6)
8							
9	**Additional information**						
10	Tax Rate	0.3					
11	Market price of Equity shares	96					
12	Expected Dividend	9					
13	Dividend Growth rate	0.05					
14	Interest rate on Debentures	0.1					
15	Preference dividend rate	0.09					
16	Interest rate on Term Loan	0.12					
17							

The output

	A	B	C	D	E	F	G
1	**Capital Structure**						
2	**Source**	**No. of units**	**Price**	**Amount**	**Cost of Capital**	**Weight**	**Weighted Cost**
3	Equity Shares	₹ 5000	₹ 100	₹ 500,000	14.38%	0.33	4.79%
4	9% preference Shares			₹ 200,000	9.00%	0.13	1.20%
5	10% Debentures			₹ 300,000	7.00%	0.20	1.40%
6	12% Term Loan			₹ 500,000	8.40%	0.33	2.80%
7	Total			₹ 1,500,000		1	10.19%
8							
9	**Additional information**						
10	Tax Rate	30%					
11	Market price of Equity Shares	96					
12	Expected dividend	₹ 9.00					
13	Dividend Growth rate	5%					
14	Interest rate on Debentures	10%					
15	Preference dividend rate	9%					
16	Interest Rate on Term Loan	12%					

Example A.21

The balance sheet of Alpha Numeric Company is given below :

Liabilities	Amount	Assets	Amount
Equity capital (₹ 10 per share)	₹ 90,000	Fixed Assets	₹ 2,25,000
Retained Earnings	30,000	Current Assets	75,000
10% Debt	1,20,000		
Current Liabilities	60,000		
	3,00,000		3,00,000

The company's total assets turnover ratio is 3, its fixed operating cost is ₹ 1,50,000 and its variable operating cost ratio is 50%. The income-tax rate is 50%.

You are required to :

(*i*) Calculate the different type of leverages for the company.

(*ii*) Find out the EBIT if EPS is : (*a*) ₹ 1 (*b*) ₹ 2 (*c*) ₹ 0.

The modulation and output of this case can be presented as follows:

	A	B	C	D	E	F	G
1	**Balance Sheet of Alpha Ltd.**					**Income Statement**	
2	**Liabilities**	**Amount**	**Assets**	**Amount**		**Details**	**Amount**
3	Equity Shares (10 per share)	90000	Fixed Assets	225000		Sales	=B10
4	Retained Earnings	30000	Current Assets	75000		–VC	=G3*B11
5	10% Debt	120000				**Contribution Margin**	=G3–G4
6	Current Liabilities	60000				Fixed Operating Cost	=B12
7	Total	=SUM(B3:B6)		=SUM(D3:D6)		**EBIT**	=G5–G6
8						Interest	=B5*B14
9	Total Assets Turnover Ratio	3	(Sales/Total Assets)			**Profit Before Tax**	=G7–G8
10	Sales	=D7*B9				**Tax**	=G9*B13
11	Variable cost (VC) ratio	0.5				**Profit After Tax**	=G9–G10
12	Fixed Operating Cost	150000					

	A	B	C	D	E	F	G
13	Income Tax Rate	0.50			**Leverage Ratios**		
14	Rate of Interest on Debt	0.10			**Operating Leverage**	**=G5/G7**	=Contribution/EBIT
15					**Financial Leverage**	**=G7/G9**	=EBIT/Profit Before Tax
16					**Combine Leverage**	**=G5/G9**	=Contribution/PBT

The output

	A	B	C	D	E	F	G
1	**Balance Sheet of Alpha Ltd.**					**Income Statement**	
2	**Liabilities**	**Amount**	**Assets**	**Amount**		**Details**	**Amount**
3	Equity Shares (10 per share)	₹ 90,000	Fixed Assets	₹ 225,000		Sales	₹ 900,000
4	Retained Earnings	₹ 30,000	Current Assets	₹ 75,000		–VC	₹ 450,000
5	10% Debt	₹ 120,000				**Contribution Margin**	₹ 450,000
6	Current Liabilities	₹ 60,000				–Fixed Operating Cost	₹ 150,000
7	Total	₹ 300,000		₹ 300,000		**EBIT**	₹ 300,000
8						–Interest	₹ 12,000
9	Total Assets Turnover Ratio	3	(Sales/Total Assets)			**Profit Before Tax**	288,000
10	Sales	₹ 900,000				–Tax	₹ 144,000
11	Variable cost (VC) ratio	50%				**Profit After Tax**	₹ 144,000
12	Fixed Operating Cost	₹ 150,000					
13	Income Tax Rate	50%			**Leverage Ratios**		
14	Rate of interest on Debt	10%			**Operating Leverage**	**1.5**	=Contribution/EBIT
15					**Financial Leverage**	**1.042**	=EBIT/Profit Before Tax
16					**Combined Leverage**	**1.563**	=Contribution/PBT

Example A.22

From the following information available for 4 firms, calculate the EBIT, the EPS, the Operating leverage and the Financial leverage :

Solution :

	Firm P	Firm Q	Firm R	Firm S
Sales (in Units)	20,000	25,000	30,000	40,000
Selling price per unit (₹)	15	20	25	30
Variable cost per unit (₹)	10	15	20	25
Fixed costs (₹)	15,000	40,000	50,000	60,000
Interest (₹)	30,000	25,000	35,000	40,000
Tax %	30	30	30	30
Number of Equity Shares	5,000	9,000	10,000	12,000

The modulation and output of this case can be presented as follows:

	A	B	C	D	E	F	G	H	I	J
1	**Income Statement**					**Calculations**				
2	**Details**	**Firm P**	**Firm Q**	**Firm R**	**Firm S**	**Leverages**	**Firm P**	**Firm Q**	**Firm R**	**Firm S**
3	Sales (Quantity)	20000	25000	30000	40000	**Operating Leverage (=Contribution/EBIT)**	=B13/B14	=C13/C14	=D13/D14	=E13/E14
4	Sales Price (per unit)	15	20	25	30	**Financial Leverage (=EBIT/PBT)**	=B14/B15	=C14/C15	=D14/D15	=E14/E15
5	Variable Cost (per unit)	10	15	20	25	**Combined Leverage (=OL*FL)**	=G3*G4	=H3*H4	=13*14	=J3*J4
6	Fixed Cost	15000	40000	50000	60000	**Earning Per Share**	=B17/B8	=C17/C8	=D17/D8	=E17/E8
7	Interest	30000	25000	35000	40000					

	A	B	C	D	E	F	G	H	I	J
8	No. of Equity Shares	5000	9000	10000	12000					
9	Tax rate	0.30	0.30	0.30	0.30					
10										
11	Sales	=B3*B4	=C3*C4	=D3*D4	=E3*E4					
12	Variable Cost	=B3*B5	=C3*C5	=D3*D5	=E3*E5					
13	Contribution Margin	=B11–B12	=C11–C12	=D11–D12	=E11–E12					
14	EBIT	=B13–B6	=C13–C6	=D13–D6	=E13–E6					
15	Profit Before Tax	=B14–B7	=C14–C7	=D14–D7	=E14–E7					
16	Tax	=B15*B9	=C15*C9	=D15*D9	=E15*E9					
17	**Profit After Tax**	**=B15-B16**	**=C15-C16**	**=D15-D16**	**=E15-E16**					

The output

	A	B	C	D	E	F	G	H	I	J
1		**Income Statement**				**Calculations**				
2	**Details**	**Firm P**	**Firm Q**	**Firm R**	**Firm S**	**Leverages**	**Firm P**	**Firm Q**	**Firm R**	**Firm S**
3	Sales (Quantity)	20000	25000	30000	40000	**Operating Leverage (=Contribution/EBIT)**	1.176	1.471	1.500	1.429
4	Sales Price (per unit)	₹ 15	₹ 20.00	₹ 25,00	₹ 30.00	**Financial Leverage (=EBIT/PBT)**	1.545	1.417	1.538	1.400
5	Variable Cost (per unit)	₹ 10	₹ 15.00	₹ 20.00	₹ 25.00	**Combined Leverage (=OL*FL)**	1.818	2.083	2.308	2.000
6	Fixed Cost	₹ 15,000	₹ 40,000.00	₹ 50,000.00	₹ 60,000.00	**Earning Per Share**	₹ 7.70	₹ 4.67	₹ 4.55	₹ 5.83
7	Interest	₹ 30,000	₹ 25,000.00	₹ 35,000.00	₹ 40,000.00					
8	No. of Equity Shares	5000	9000	10000	12000					
9	Tax rate	30%	30%	30%	30%					
10										
11	Sales	₹ 300,000	₹ 500,000	₹ 750,000	₹ 1,200,000					
12	Variable Cost	₹ 200,000	₹ 375,000	₹ 600,000	₹ 1,000,000					
13	Contribution Margin	₹ 100,000	₹ 125,000	₹ 150,000	₹ 200,000					
14	EBIT	₹ 85,000	₹ 85,000	₹ 100,000	₹ 140,000					
15	Profit Before Tax	₹ 55,000	₹ 60,000	₹ 65,000	₹ 100,000					
16	Tax	₹ 16,500	₹ 18,000	₹ 19,500	₹ 30,000					
17	**Profit After Tax**	**₹ 38,500**	**₹ 42,000**	**₹ 45,500**	**₹ 70,000**					

DELHI UNIVERSITY

B.Com. (Hons.) November 2013 (Semester V)

1. (*a*) "While evaluating single project with conventional cash flows, both NPV and IRR methods give identical results." Elucidate the statement.

(*b*) A particular project has a four year life with yearly projected net profit of ₹ 10,000 after charging yearly depreciation of ₹ 8,000 in order to write off the capital cost of ₹ 32,000. Out of the capital cost, ₹ 20,000 is payable immediately (year 0) and balance in next year (which will be needed for evaluation). Stock amounting to ₹ 6000 (to be invested in year 0) will be required throughout the project and for debtors, a further sum of ₹ 8,000 will have to be invested in year 1. The working capital will be recouped in year 5. It is expected that the machinery will fetch a residual value of ₹ 2,000 at the end of 4th year 1. Income tax is payable @ 40% and the depreciation is charged on writing down value of 25% per annum.

Income tax is payable next year. The residual value of the machine ₹ 2,000 also bears tax @ 40%. Although the profit is for 4 years, for computation of tax and realization of working capital, the computation will be required up to 5 years. Advise the firm.

OR

(*a*) How the financial decision making involve risk-return trade-off?

(b) A company has to make a choice between two identical machines, A and B which have been designed differently but do exactly the same job.

Machine A costs ₹ 7,50,000 and will last for 3 years. It will cost ₹ 2,00,000 per year to run. Machine B is an economy model costing only ₹ 5,00,000 but will last only 2 years. Its running charges are ₹ 3,00,000 per year.

Ignore taxes. If the opportunity cost of capital is 9% which machine the company should buy ?

2. (*a*) What are implicit costs and how are they relevant in calculating weighted average cost of capital?

(*b*) ABC Ltd. has the following Capital structure:

Equity share capital (4,00,000 shares of ₹ 10 each)	₹ 40,00,000
12% Preference shares	₹ 4,00,000
10% Debentures	₹ 6,00,000

The equity shares of the company are quoted at ₹ 110 and the company is expected to declare a dividend of ₹ 15 per share. Rate of growth of dividend is 8 % which is expected to be maintained. Assuming tax rate @ 40% :

(i) Calculate WACC.

(ii) The Company wants to raise additional Term Loan of ₹ 5,00,000 at 10%. Calculate the revised WACC assuming the market price of equity share has gone to ₹ 105.

OR

(a) Comment on the utility of Net Income Approach of Capital Structure in real world.

(*b*) The following are details of Bankers Ltd. for the year ending 31.03.2016.

Operating Leverage	3
Financial Leverage	2
Interest charges per annum	₹ 20 Lakhs
Corporate Tax Rate	50%
Variable Cost as percentage of Sales	60%

Prepare Income Statement of the Company.

3. (*a*) Discuss the different approaches of financing of working capital requirement.

(*b*) A company has an EBIT of ₹ 3,00,000 and overall cost of capital 12.5%. The Company has debt of ₹ 5,00,000 borrowed @ 8%. Find the value of the company using NOI approach.

Show using NOI approach, how change in debt by ₹ 3,00,000 have impact on the cost of equity of the company.

OR

(*a*) "Trading on equity is resorted to with a view to decrease earnings per equity share". Comment.

(*b*) ABC Ltd. has outstanding 1,20,000 share selling of ₹ 20 per share. It hopes to make a net income of ₹ 3,50,000 during the year ending 31st March, 2016. The company is considering to pay a dividend of ₹ 2 per share at the end of the current year. The capitalization rate for risk class of this company has been estimated to be 15%.

Assuming no taxes, answer the questions listed below on the basis of the Modigliani – Miller Dividend Valuation Model:

(*i*) What will be the price of the share at the end of 31st March, 2016, if

(*a*) The dividend is paid.

(*b*) The dividend is not paid.

(*ii*) How many new shares must be issued by the company if the dividend is paid and company needs ₹ 7,40,000 for an approved investment expenditure during the year.

4. (*a*) Discuss the consequences of lengthening and shortening of credit period by a firm.

(*b*) XYZ Ltd. supplied the following information:

Sales and Production for the year	69,000 units
Finished Goods in store	3 month
Raw Material in store	2 months
Production process	1 month
Credit allowed by Creditors	2 months
Selling Price per unit	₹ 50.00
Raw Material	50% of Selling price
Direct Wages	10% of Selling Price
Overheads	20% of Selling Price

20% sales are on cash basis and credit sales are allowed to its customers for one month. Overheads include ₹ 5 as depreciation. There is regular Production and Sale cycle

and Wages and Overheads are paid 15 days in arrears. Material is introduced in the beginning of production cycle. You are required to find out its working capital requirement on cash-cost basis.

OR

(*a*) What is EBIT-EPS Analysis? How is it different from Leverage analysis ?

(*b*) XYZ has a present annual sales turnover of ₹ 40 Lacs. The units sale price is ₹ 20. The variable costs are ₹ 12 per annum and fixed costs amount to ₹ 5 Lacs per annum. The present credit period of one month is proposed to be extended to either two or three months which will be more profitable. The following additional information is available :

Credit Period	1 Month	2 Months	3 Months
Increase in Sales by	—-	10%	30%
Percentage of Bad debts to Sales	1	2	5

Fixed cost will increase by ₹ 75000 when sales will increase by 30 %. The company requires a pre tax return on investment at 20%.

Evaluate the profitability of the proposal and recommend best credit period for the company.

5. Write short notes on :

(*i*) Motives for holding cash.

(*ii*) Factors affecting dividend policy of a firm.

(*iii*) Stock-out

OR

(*a*) Corporate governance is a system which ensures that companies are managed in the best interest of all the stockholders. Discuss.

(*b*) "Cash flows of different periods in absolute terms are incomparable." Explain.

SUGGESTED ANSWERS TO PRACTICAL QUESTIONS

Q1(b). Initial Outflows :

Capital cost at T_0	₹ 20,000
Capital cost at T_1 (₹ 12,000×.909)	10,908
Working Capital (Stock) at T_0	6,000
Working Capital (Debtors) at T_1 (₹ 8,000×.909)	7,272
	44,180

Subsequent Annual Inflows :

	Year 1	Year 2	Year 3	Year 4	Year 5
Net Profit	10,000	10,000	10,000	10,000	–
+Depreciation	8,000	8,000	8,000	8,000	–
+Residual Value	–	–	–	2,000	–
–Tax @ 40% (Preceding year)		4,000	4,000	4,000	–4,800
+Recovery of Working Capital	–	–	–	–	14,000
Cash Inflows	18,000	14,000	14,000	16,000	9200
$PVF_{(10,n)}$	.909	.826	.751	.683	.621
Present Values	16,362	11,564	10,514	10,928	5,713

Calculation of NPV:

PV of Annual Inflows (15,362+11,564+10,514+10,928+5,713)	₹ 55,081
Less: Initial Outflows	44,180
	₹ 10,901

As the NPV of the project is positive, firm can take it up .

OR

Q1(b). As the lives of two machines are different, the decision can be taken up on the basis of Equivalent Annuity Value of outflows as follows:

	Machine A	Machine B
Cost (A)	₹ 7,50,000	₹ 5,00,000
Life	3years	2 years
PV of Annual cost (B)	(₹ 2,00,000×$PVAF_{9,3}$) (₹ 2,00,000×2.531) = ₹ 5,06,200	(3,00,000×$PVAF_{9,2}$) (₹ 3,00,000×1.759) = ₹ 5,27,700
PV of Total Cost (A+B)	₹ 12,56,200	₹ 10,27,700
÷ $PVAF_{(9,n)}$	2.531	1.759
Equivalent Annuity Value	₹ 4,96,326	₹ 5,84,252

Q2(b) Calculation of Specific Cost of Capital:

Cost of Equity, k_e : $k_e = (D_1/P_0)+g$

$= \frac{₹\ 15}{₹\ 110} + .08 = 21.63\%$

Cost of Debt, k_d: k_d=Int (1–t)= ₹ 10 (1–.4) = 6%

Cost of Pref. Capital: $k_p = PD/P_0 = 12/100 = 12\%$

Calculation of WACC:

Source	Amount	Sp.C/C	Weight	Spck× W
Equity Capital	₹ 44,00,000	.2163	.8149	.1763
12%Pref. Capital	4,00,000	.1200	.0740	.0089
10% Debt	6,00,000	.0600	.1111	.0067
	54,00,000		1.000	.1919

WACC of the firm is 19.19%.

Calculation of New WACC after additional Term-loan:

k_d (Term Loan) : k_d=10(1–.4) = 6%

k_e (New) : $k_e = (D_1/P_0) = 6\% = (₹\ 15/₹\ 105) + .08 = 22.29\%$

Source	Amount	Sp. C/C	Weight	WxSp. C/C
Equity Capital	₹ 42,00,000	.2229	.7368	.1642
12% Pref. Capital	4,00,000	.1200	.0702	.0084
10% Debt	6,00,000	.0600	.1053	.0063
10% Term Loan	5,00,000	.0600	.0877	.0053
	57,00,000		1.000	.1842

New WACC after raising Term Loan would be 18.42 %.

OR

Q2(b) Calculation of EBIT:

Financial Leverage = 2 (given)

Interest = ₹ 20,00,000

Now, FL $= \frac{EBIT}{PBT} = \frac{EBIT}{EBIT - Int.}$

2	= EBIT/(EBIT – ₹ 20,00,000)
2 EBIT – ₹ 40,00,000	= EBIT
EBIT	= ₹ 40,00,000

Calculation of Contribution:

Operating Leverage	= 3 (given)
EBIT	= ₹ 40,00,000
OL	$= \frac{\text{Contribution}}{\text{EBIT}}$
Now, 3	$= \frac{\text{Contribution}}{₹\ 40,00,000}$
So, Contribution	= ₹ 120,00,000
Fixed cost	= ₹ 120,00,000–₹ 40,00,000
	= ₹ 80,00,000

Calculation of Sales:

%Variable Cost	= 60%
So, Contribution	= 40%
Contribution	= ₹ 120,00,000
So, Sales	= ₹ 1,20,00,000 ÷ .4
	= ₹ 3,00,00,000

Now, Income Statement can be prepared as follows:

Sales	₹ 3,00,00,000
Less: Variable cost (60%)	1,80,00,000
Contribution	1,20,00,000
Less : Fixed cost	80,00,000
EBIT	40,00,000
Less: Interest	20,00,000
PBT	20,00,000
Less: Tax @ 50%	10,00,000
Profit After Tax (PAT)	10,00,000

Q3(b). Value of the Firm and impact on cost of equity under NOI:

	Existing	Increase of ₹ 3,00,000	Decrease of ₹ 3,00,000
8% Debt Amount	₹ 5,00,000	₹ 8,00,000	₹ 2,00,000
EBIT (A)	₹ 3,00,000	₹ 3,00,000	₹ 3,00,000
Capitalization Rate, k_0	12.5%	12.5%	12.5%
Value of Firm (EBIT÷ k_0)	₹ 24,00,000	24,00,000	24,00,000
Less: Debt	5,00,000	8,00,000	2,00,000
Value of Equity	19,00,000	16,00,000	22,00,000
Interest @ 8% (B)	40,000	64,000	16,000
NP for equity (A–B)	2,60,000	2,36,000	2,84,000
k_e (= NP / V_E)	13.68%	14.75%	12.91%

It can be seen that the cost of equity, k_e is increasing or decreasing with the respective change in Debt amount in the Capital Structure.

Q3(b). Calculation of Price of Share on 31-3-2016:

	Dividend is paid	Dividend is not Paid
P_1	=P_0 (1+k_e)–D	= P_0 (1+k_e) – D
	=₹ 20 (1+.15) – 2	= ₹ 20 (1+.15) – 0
	=₹ 21	= ₹ 23

No. of New shares to be issued:

Earnings	₹ 3,50,000
Dividend paid	2,40,000
Retained earnings (A)	1,10,000
Total investment (B)	7,40,000
Fresh Funds required (B–A)	6,30,000
Market Price of shares	₹ 21
No. of Shares (6,30,000 ÷ 21)	30,000

Q4(b). Calculation of Working Capital Requirement:

Production per month (69,000/12)	5,750 units
Selling Price	₹ 50
Raw Material (50%)	₹ 25
Direct Wages (10%)	₹ 5
Overheads (20%)	₹ 10
Total Cash Cost (₹ 25+₹ 5+₹ 5)	₹ 35

Statement of Working Capital Requirement

I. Current Assets

Raw Material (5,750×25×2)	₹ 2,87,500
Work-in-Progress – RM (5,750×25×1)	1,43,750
Wages (5,750×5×1) 50%	14,375
OH ((5,750×5×1) 50%	14,375
Finished Goods (5,750×35×3)	6,03,750
Debtors (5,750×35×1) 80%	1,61,000
Total Current Assets	12,24,750

II. Current Liabilities

Creditors (5,750×25×2)	₹ 2,87,500
Wages (5750×5×1)	28,750
Overheads (5750×5×1/2)	14,375
Total Current Liabilities	3,30,625
Net Working Capital (CA–CL)	₹ 8,94,125

OR

4(b) Evaluation of Profitability under different Credit Periods

	One Month	Two Months	Three Months
Sales @ ₹ 20	₹ 40,00,000	₹ 44,00,000	₹ 52,00,000
–Variable cost @ ₹ 12	24,00,000	26,40,000	31,20,000
–Fixed cost	5,00,000	5,00,000	5,75,000
Total cost	29,00,000	31,40,000	36,95,000
Surplus (A)	11,00,000	12,60,000	15,05,000
Average Debtors at cost	2,41,667	5,23,333	9,23,750
Cost of financial @ 20 %	48,333	1,04,667	1,84,750
Bad debts (1%/2%/5%)	40,000	88,000	2,60,000
Total Cost (B)	88,333	1,92,667	4,44,750
Net Surplus (A–B)	10,11,667	10,67,333	10,60,250
Incremental Surplus		55,667	48,583

The firm may increase the credit period from one-month to 2 months because the incremental profit in this case is more than that of 3 months credit period.

DELHI UNIVERSITY

B.Com. (Hons.) November 2014 (Semester V)

1. (*a*) Explain how the scope of finance function has changed overtime. What role a finance manager play in a modern firm ?

(*b*) ABC & Co. is considering a proposal to replace one of its plants costing ₹ 60,000 and having a written down value of ₹ 24,000. The remaining economic life of the plant is 4 years after which it will have no salvage value. However, if sold today, it has a salvage value of ₹ 20,000. The new machine costing ₹ 1,30,000 is expected to have a life of 4 years with a scrap value of ₹ 18,000. The new machine, due to its technological superiority, is expected to contribution additional annual benefits (before depreciation and tax) of ₹ 60,000. Find out the cash flows associated with this decision given that the tax rate applicable to the firm is 40% (The capital gain or loss may be taken as not subject to tax).

OR

(*a*) "Potential analyst should take into account the time value of money." Explain with suitable examples.

(*b*) A machine purchased six years back for ₹ 1,50,000 has been depreciated to a book value of ₹ 90,000. It originally had a projected life of 15 years (salvage nil). There is a proposal to replace this machine. A new machine will cost ₹ 2,50,000 and result in reduction of operating cost by ₹ 30,000 p.a. for next nine years. The existing machine can now be scrapped away for ₹ 50,000. The new machine will also be depreciated over 9 years period as per straight line method with salvage of ₹ 25,000. Find out whether the existing machine be replaced given that the tax rate applicable is 30% and cost of capital 10% (profit or loss on sale of assets is to be ignored for tax purposes).

2. (*a*) The cost of preference share capital is generally lower than the cost of equity. State the reasons.

(*b*) A new project is under consideration in XYZ Ltd., which requires a capital investment of ₹ 4.50 crore. Interest on Term loan is 12% and corporate tax rate is 50%. If the debt equity ratio insisted by the financing agencies is 2:1, calculate the point of indifference for the project.

OR

(*a*) Is it true that a firm with high degree of operating leverage should have high degree financial leverage ?

(*b*) The following figures are taken from the current Balance Sheet of a company :

Capital	₹ 8,00,000
Share Premium	2,00,000
Reserves	6,00,000
Shareholder's Funds	16,00,000
12% Perpetual Debentures	4,00,000

An annual dividend of ₹ 2 per share has just been paid. In the past, dividends have grown at a rate of 10 per cent per annum and this rate of growth is expected to continue. Annual interest has recently been paid on Debentures. The shares are currently quoted at ₹ 27.50 and the Debentures at 80 per cent. Ignore taxation. You are required to estimate the Weighted Average Cost of Capital (based on Market Value) for the company.

3. (*a*) How the cost of equity capital behaves in the Traditional Theory and MM Approach of Capital Structure?

(*b*) From the following data, compute the duration of the operating cycle for each of the two years and comment on the increase / decrease:

	Year 1	Year2
Raw Materials	20,000	27,000
Work-in-progress	14,000	18,000
Finished Goods	21,000	24,000
Purchases	96,000	1,35,000
Cost of Goods Sold	1,40,000	1,80,000
Sales	1,60,000	2,00,000
Debtors	32,000	50,000
Creditors	16,000	18,000

Assume 360 days per year for computational purposes.

OR

(*a*) What do you mean by Stockout ? Explain the trade off between stockout and carrying cost of inventory.

(*b*) A company intends to produce a product with its selling price of ₹ 1,000 per unit and expected annual sales of 5,000 units. Variable costs amount to ₹ 750 per unit and 2 month's credit is given to its customers. It is estimated that 10 per cent of customers will default, others will pay on the due day. Interest rates are 15 per cent per annum. A credit agency has offered the company a system which it claims can help identify possible bad debts. It will cost ₹ 2,50,000 per annum to run and will identify 20 per cent of customers as being potential bad debts. If these customers are rejected no actual bad debts will result. Should the credit system be used ?

4. (*a*) How does Gorden model differ from Walter's approach to relevance of dividends ? what are their similarities ?

(*b*) ABC Ltd. purchases 9000 units of spare parts for its annual requirements, ordering one month usage at a time. Each spare part costs ₹ 20. The ordering cost per order is ₹ 15 and the carrying charges are 15% of unit cost. You have been asked to suggest a more economical purchasing policy for the company. What advice would you offer, and how much would it save the company per year ?

OR

(*a*) "Miller-Orr model of Cash Management is more realistic than Baumal Model." Explain.

(*b*) A firm had paid dividend at ₹ 2 per share last year. The estimated growth of the dividends from the company is estimated to be 5% p.a. Determine the estimated market price of the equity share if the estimated growth rate of dividends (i) rises to 8% and (ii) falls to 3%. Also find out the present market price of the share, given that the required rate of return of the equity investors is 15.5% and comment.

5. Define float. Distinguish between payment float and collection float. What is the objective in float management ?

OR

Write short notes on:

(*i*) Stock - split

(*ii*) Operating Cycle

(*iii*) EBIT-EPS Analysis.

SUGGESTED ANSWERS TO PRACTICAL QUESTIONS

Q1(b) Initial Outflows :

Cost	₹ 1,30,000
–Salvage Value of existing plant	20,000
Net Outflow	1,10,000

Subsequent Annual Inflows:

Annual Benefits	₹ 60,000
–Depreciation (Incremental) (₹ 28000 – ₹ 6000)	22,000
Incremental PBT	38,000
–Tax @ 40%	15,200
Profit after Tax	22,800
+Depreciation	22,000
Annual cash flow	44,800

Terminal Inflows:

Salvage Value	₹ 18,000

OR

Q1(b) Initial Outflows :

Cost	₹ 2,50,000
–Salvage Value of existing	50,000
Net Outflow	2,00,000
Subsequent Annual Inflows:	
Decrease in Operating Cost	₹ 30,000
Increase in Depreciation	15,000
Net Increase in PBT	15,000
–Tax @ 30%	4,500
Net Increase in PAT	10,500
+Depreciation	15,000
Incremental Cash flows	25,500
Terminal Cash Inflows : Salvage value	₹ 25,000

Calculation of Net Present Value:

P.V. of Subsequent Annual Inflows (₹ 25,500×$PVAF_{(10,9)}$)	(₹ 25,000×5.758)	₹ 1,46,829
+P.V. of Terminal Inflows	(₹ 25,000×$PVF_{(10,9)}$) (₹ 25,000x.424)	10,600
		1,57,429
Less : Initial Outflow		2,00,000
Net Present Value		–42,571

As the NPV of the Proposal is negative, the firm need not replace the existing machine.

Q2(b) In the given case, the indifference level of EBIT can be calculated between the Loan option (given) and Equity option (implied).

Loan Option:

Total Funds	:	₹ 4,50,00,000
Debt-equity Ratio	:	2:1
So, 12% Debt	:	₹ 3,00,00,000
Equity	:	₹ 150,00,000 (Shares of ₹ 10 each)

Equity Option: Equity : ₹ 4,50,00,000 (shares of ₹ 10 each)

Indifference level of EBIT:

$$= \frac{(EBIT - ₹\ 36,00,000)(1-.5)}{15,00,000} = \frac{(EBIT)\ (1-.5)}{45,00,000}$$

1.5 EBIT–₹ 54,00,000 = .5 EBIT

EBIT = ₹ 54,00,000

OR

Q2 (b) Equity shares have been assumed to have face value of ₹ 10 each.

Calculation of Specific Cost of Capital :

$$k_e = \frac{₹\ 2.20}{₹\ 27.50} + .10 = 18.0\%$$

$$k_d = \frac{₹\ 12}{₹\ 80} \times 100 = 15.0\%$$

Calculation WACC (based on MV):

	Mkt. Values	Sp. c/c	W	W × c/c
Equity Capital	₹ 22,00,000	.18	.873	.15714
12% Debentures	3,20,000	.15	.127	.01905
	25,20,000			.17619

So, WACC (MV) is 17.62%.

Q 3(b)

Calculation of Operating Cycle:

	Year 1	Year 2
1. **Raw Material Stock** (Average Raw material/Total Purchase) × 360	20/96 × 360 = 75 days	27/135 × 360 = 72 days
2. **Creditors period** (Average Creditor/Total Purchase) × 360	16/96 × 360 = – 60 days	18/135 × 360 = – 48 days
3. **Work-in-progress** (Average Work-in-progress/Total cost of goods sold) × 360	14/140 × 360 = 36 days	18/180 × 360 = 36 days
4. **Finished Goods** (Average Finished goods/Total cost of goods sold) × 360	21/140 × 360 = 54 days	24/180 × 360 = 48 days
5. **Debtors** (Average Debtors/Total Sales) × 360	32/160 × 360 = 72 days	50/200 × 360 = 90 days
Net operating cycle	177 days	198 days

There is an increase in length of operating cycle by 21 days *i.e.,* 12% increase approximately. Reasons for increase are as follows :

Debtors taking longer time to pay (90 – 72)	18 days
Creditors receiving payment earlier (60 – 48)	12 days
	30 days
–Finished Goods turnover lowered (54 – 48)	6 days
–Raw Material stock turnover lowered (75 – 72)	3 days
Increase in Operating Cycle	21 days

Q. 3(b) Existing Policy:

Sales (₹ 1,000×5,000)	₹ 50,00,000
–Bad Debts (10%)	5,00,000
Net Sales	45,00,000
–Variable Cost (₹ 750×5,000)	37,50,000
Surplus	7,50,000
–Interest on investment in Debtors (₹ 37,50,000/(2/12)×15%)	93,750
Net Surplus	6,56,250

Proposed Policy:

Sales (₹ 1,000×4,000)	₹ 40,00,000
–Variable Cost (₹ 750×4,000)	30,00,000
–Interest on Investment in Debtors (₹ 30,00,000/(2/12)×15%	75,000
–Cost of Credit Agency	2,50,000
Net Surplus	6,75,000

Net Profit due to Credit Agency (₹ 6,75,000 –₹ 6,56,250) = 18,750

Comment: The firm can accept the proposal offered by the Credit Agency.

Q4(b) The existing cost of maintaining inventory is as follows:

Since, the firm is buying 9,000 units which are purchased in orders of 1 month usage, therefore, the number of units being ordered per order is 9,000/12 = 750 units, and the firm is placing 12 orders in a year, and the average inventory is 375 units (*i.e.*,750/2). Now,

Ordering cost (12 × ₹ 15)	₹ 180
Carrying cost (20 × 375 × 15%)	1,125
Total annual cost of existing policy	1,305

The economic order quantity may be ascertained as follows:

$$EOQ = \sqrt{\frac{2AO}{C}}$$

Or, $EOQ = [(2AO)/C]^{1/2}$

where, EOQ = Economic quantity per order.

A = 9,000 units

O = ₹ 15

C = 15% of ₹ 20 = ₹ 3

Now, $EOQ = [(2AO)/C]^{1/2}$

$= [(2 \times 9{,}000 \times 15)/3]^{1/2}$

= 300 units.

So, the EOQ is 300 units and the number of orders in a year would be 9,000/300 = 30, and the average inventory would be 300/2 = 150 units. The cost of maintaining this economic order quantity is as follows:

Ordering cost (30 × 15)	₹ 450
Carrying cost (20 × 150 × 3)	450
Total annual cost of existing policy	900

So, the firm can save in annual cost of maintaining inventory to the extent of ₹ 1,305–900 = ₹ 405.

Or

Q 4 (b) In this case, the company has paid a dividend of ₹ 2 during the last year. The growth rate *g*, is 5%. Then, the current year dividend (D_1) with the expected growth rate of 5% will be ₹ 2.10.

The share price is, $P_0 = \frac{D_1}{k_e - g}$

$= \frac{₹\ 2.10}{.155 - .05} = ₹\ 20$

In case the growth rate rises to 8% then the dividend for the current year (D_1) would be ₹ 2.16 and the market price would be:

The share price is, $P_0 = \frac{D_1}{k_e - g}$

$= \frac{₹\ 2.16}{.155 - .08} = ₹\ 28.80$

In case the growth rate falls to 3% then the dividend for the current year (D_1) would be ₹ 2.06 and the market price would be:

The share price is, $P_0 = \frac{D_1}{k_e - g}$

$= \frac{₹\ 2.06}{.155 - .03} = ₹\ 16.48$

So, the market price of the share is expected to vary in response to change in expected growth rate in dividends.

DELHI UNIVERSITY

B.Com. (Hons.) November 2015 (Semester V)

1. (*a*) A Company is selling a debenture which will provide annual interest payment of ₹ 1,200 for indefinite number of years. Should the debenture be purchased, if it is being quoted in the market for ₹ 10,500 and the required rate of return is 12 per cent? What will be your answer if the required rate of return is 10 per cent?

(*b*) Why is it inappropriate to seek profit maximization as the goal of financial decision making? How would you justify the adoption of Wealth maximization as an apt substitute for it?

OR

(*a*) Why is consideration of time important in financial decision making? How can time be adjusted?

(*b*) What do you mean by financial management? How is it different from financial accounting?

2. (*a*) What are the similarities and dissimilarities between Net Present Value (NPV) and Internal Rate of Return (IRR)? Which of these methods will you prefer when they give different ranking of investment proposals? Why?.

(*b*) Google Enterprise Ltd., has two investment proposals - Proposal A and Proposal B. These are mutually exclusive. Proposal A requires initial cash outlay of ₹ 3,40,000 and Proposal B requires initial cash outlay of ₹ 3,30,000. The riskless rate is 8%. Use certainty equivalent approach (C.E) to determine which of the two projects should be accepted? The expected net cash inflows and C.E.'s are given below:

Year End	Project A		Project B		PVF @ 8%
	Cash Inflow	C.E	Cash Inflow	C.E	
1	₹ 1,80,000	0.8	₹ 1,80,000	0.9	0.926
2	₹ 2,00,000	0.7	₹ 1,80,000	0.8	0.857
3	₹ 2,00,000	0.6	₹ 2,00,000	0.7	0.794

OR

(*a*) What is meant by Cost of Capital? What are its components? How is the cost of retained earnings estimated?

(*b*) A Company purchased a machine 1 year ago at a cost of ₹ 18,000. At that time, the machine was estimated to have a useful life of 6 years and no salvage value. The annual operating cost is ₹ 20,000. A new machine has just come in the market which will do the same job but with an annual operating cost of only ₹ 17,000. This new machine will cost Rs. 21,000 and has a life of 5 years with no salvage value. The old machine can be sold for ₹ 15,000. The company uses straight line method of depreciation. The tax rate is 40% and cost of capital is 12%. Compute Net Present Value. Should the machine be replaced?

3. (*a*) Explain the factors which should be taken into account while making a capital budgeting decision?

(*b*) 'L' Ltd. And 'U' Ltd. are identical except that 'L' Ltd., has issued 10% debentures of ₹ 9,00,000 while 'U' Ltd.. has only equity shares in its capital structure. Both the firms have operating profit of ₹ 3,00,000. Assume capitalization rate of 15% for all equity firms:

(*i*) Compute the value of the two firms using Net Income (NI) Approach.

(*ii*) Compute the value of the two firms using Net Operating Income (NOI) Approach.

OR

(*a*) 'Market Value Weights' are superior to 'Book Value Weights'. Comment.

(*b*) Two firms 'X' and 'Y' are identical in all respects except the degree of leverage. Firm 'X' has 8% debentures of ₹ 20,00,000. Operating profit of both firms is ₹ 6,00,000, and tax rate is 45%. Equity capitalization rate of 'Y' is 10%. Calculate value of each firm according to MM approach and cost of equity of 'X' Ltd. Also compute the overall cost of capital of 'X' Ltd.

4. (*a*) What are the various factors which affect business and financial risk of a firm? Differentiate between the two types of risks.

(*b*) Following are the details regarding three companies:-

	'A' Ltd.	**'B' Ltd.**	**'C' Ltd.**
Internal Rate of Return (r)	15%	10%	8%
Cost of Capital (k)	10%	10%	10%
Earning Per Share (E)	₹ 10	₹ 10	₹ 10

Using Walter's Model, calculate the effect of dividend payment on the value of share of each of the above companies, under the following situations:

(*i*) When no dividend is paid.

(*ii*) When dividend is paid at ₹ 8 per share.

(*iii*) When dividend is paid at ₹ 10 per share.

Explain the differences in value of shares of these companies as per Walter's Model.

OR

(*a*) What factors determine the dividend policy of a firm?

(*b*) Ram Maya Ltd., currently has ₹ 100 lakh equity shares outstanding. Current market price per share is ₹ 15. The net income for the current year is ₹ 2 crores and investment budget is also of ₹ 2 crores. Cost of equity is 12%. The company is contemplating declaration of dividend @ ₹ 1 per share. Assuming MM approach,

(*i*) Calculate market price per share if dividend is declared and if it is not declared.

(*ii*) How many new equity shares are to be issued under both options?

(*iii*) Show that the total value of shares remain unaffected by the dividend decision.

5. (*a*) Write a short note on :

(*i*) the costs associated with inventory management.

(*ii*) Credit Policy

(*b*) Birla and Ambani Company Ltd., has the total capital structure of ₹ 80,00,000 consisting of:

Ordinary Shares (2,00,000 shares)	=	50.0%
10% Preference Share Capital	=	12.5%
14% Debentures	=	37.5 %

The share of the Company sells for ₹ 20. It is expected that the Company will pay next year a dividend of ₹ 2 per share which will grow at 7% forever. Assume tax rate of 50%.

(*i*) Compute a Weighted Average Cost of Capital based on the existing capital structure.

(*ii*) Compute the new Weighted Average Cost of Capital if the Company raises an additional ₹ 20,00,000 debt by issuing 16% debentures. This would result in increasing the expected dividend to ₹ 3 per share and leave the growth rate unchanged, but the price of the share will fall to ₹ 15 per share.

OR

(*a*) What is management of working capital? State briefly the repercussions if a firm has:

(*i*) Paucity of working capital.

(*ii*) Excess of working capital.

(*b*) Estimate the working capital requirement from the particulars given below:

Production for the year	48,000 units
Finished Goods Stock	3 months
Raw Material in Stock	2 months
Credit allowed by Suppliers	2 months
Credit allowed to Debtors	3 months
Selling Price per unit	₹ 50
Raw Material cost	50% of Selling price
Direct Wages	10% of Selling price
Manufacturing Overheads	16% of Selling price
Selling Overheads	4% of Selling price
Credit Sales	75% of total Sales

There is a regular production and sales cycle and wages and overhead accrue evenly. Wages are paid with a time lag of one month. Keep a contingency margin of 10%

SUGGESTED ANSWERS TO PRACTICAL QUESTIONS

Q1. (*a*) The decision to purchase debenture can be taken up as follows

	Required Rate 12%	Required Rate 10%
Annual Interest	₹1200	₹1200
Required Rate of Return	12%	10%
PV of Interest Perpetuity	₹1200÷.12	₹1200÷.10
	= ₹ 10,000	₹ 1,2000
Current Market Price	₹10500	₹10500
Decision	Not to Purchase	Should be Purchased

Q2. (b) Decision based on Certainty Equivalents Approach:

Project A:

Year	Cash Flows	C.E. Factor	C.E. Cash Flows	PVF (8%,n)	PV
1	₹ 1,80,000	0.8	₹1,44,000	0.926	₹1,33,344
2	₹ 2,00,000	0.7	1,40,000	0.857	1,19,980
3	₹ 2,00,000	0.6	1,20,000	0.794	95,280
		PV of Inflows			3,48,604
		Less: Cost			3,40,000
		Net Present Value			8,604

Project B:

Year	Cash Flows	C.E. Factor	C.E. Cash Flows	PVF (8%,n)	PV
1	₹ 1,80,000	0.9	₹1,62,000	0.926	₹1,50,012
2	₹ 1,80,000	0.8	1,44,000	0.857	1,23,408
3	₹ 2,00,000	0.7	1,40,000	0.794	1,11,160
		PV of Inflows			3,84,580
		Less: Cost			3,30,000
		Net Present Value			54,580

As the NPV of Project B is more than that of Project A, the former should be accepted.

OR

Q2. (*b*) Total life of the Machine	6 years
Remaining life at present (6–1)	5 years
Calculation of NPV on Incremental Cash Flows:	
Incremental Outflows (₹ 21,000–₹ 15,000)	₹ 6,000
Incremental Depreciation [(₹ 21,000÷5) – (₹ 18,000÷6)]	₹ 1,200
Incremental Savings per annum (₹ 20,000–₹ 17000)	3,000
Calculation of Incremental NPV :	
Annual Savings in cost	₹ 3,000
Less: Annual Incremental Depreciation	₹ 1200
Incremental Annual Profit before tax	1,800
Less: Tax @ 40%	₹ 720
Incremental Annual Profit after tax	₹ 1,080
Add back Depreciation	₹ 1,200
Incremental Annual Cash Inflows	₹ 2,280
$PVAF_{(12\%, 5)}$	₹ 3,605
PV of Incremental Cash Inflows	₹ 8,219
Less : Incremental Cash Outflows	₹ 6,000
Incremental Net Present Value	₹ 2,219

As the Incremental NPV of the Machine is positive, it may be replaced.

Q.3 (b) Valuation of Firms under NI Approach:

	L Ltd.	**U Ltd.**
EBIT	₹3,00,000	₹3,00,000
Interest	90,000	—
Profit for Equity Shareholders (NP)	₹2,10,000	₹3,00,000
Equity Capitalization Rate	.15	.15
Value of Equity (NP÷k_e)	₹14,00,000	₹20,00,000
Value of Debt	₹9,00,000	—
Value of Firm(V)	₹23,00,000	₹20,00,000
Cost of Capital (k_o=EBIT÷V)	13.04%	15.00%

Value of Firms under NOI Approach:

	L Ltd.	**U Ltd.**
EBIT	₹3,00,000	₹3,00,000
Capitalization Rate k_o	.15	.15
Value of Firms, V	₹20,00,000	₹20,00,000
Less: Value of Debt	9,00,000	—
Value of Equity	11,00,000	20,00,000
Cost of Equity, k_e (NP÷E)	19.09%	15.00%

OR

In the given case, value of the firm is to be found under MM Approach with taxes:

Value of Unlevered Firm, Y Ltd.

$$V_y = \frac{\text{EBIT}\ (1-t)}{.10} = \frac{₹6,00,000\ (1-.45)}{.10} = ₹33,00,000$$

Value of Levered Firm, X Ltd.

$V_x = V_y + D(t)$

= ₹33,00,000+₹20,00,000 (.45)

= ₹42,000,00

Value of Equity of X Ltd. ₹ 42,000,00–₹ 20,00,000

= ₹ 22,00,000

Equity Capitalization Rate (NP÷V_E):

NP(=EBIT–Interest–Tax) (₹6,00,000–1,60,000)(1–.45)

=₹2,42,000

k_e (NP÷V_e)(=₹2,42,000÷22,00,000) = 11%

k_d(Int (1–t)=(.08(1–.45)=4.4%

Overall Cost of Capital, k_o, of the Firm :

$$k_o = k_d \left(\frac{D}{D+E}\right) + k_e \left(\frac{E}{D+E}\right)$$

$$= .044 \left(\frac{20,00,000}{42,00,000}\right) + .11 \left(\frac{22,00,000}{42,00,000}\right)$$

= 7.85%

Q.4 (b) Value of the share as per Walters Model can be found as follows:

$$P = \frac{D}{k} + \frac{\frac{r}{k}(E-D)}{k}$$

In case of A Ltd., if it does not pay any dividend and the rate of return is 10%, value of the shares can be found as follows:

$$P = \frac{0}{.10} + \frac{\frac{.10}{.10}(₹10-0)}{.10} = ₹100$$

Similarly, for different combinations of dividend amount and rate of return, the value of the shares of A Ltd., B Ltd. and C Ltd. are as follows:

k=10% EPS=E=₹10

	DIV=NIL	DIV=₹8	DIV=₹10
For A Ltd. r=15%	₹150	₹110	₹100
For B Ltd. r=10%	₹100	₹100	₹100
For C Ltd. r=8%	₹80	₹96	₹100

Value of shares for different companies are different depending upon the rate of return and DP Ratio. Under Walters Model

(*i*) If r>k, share value decreases as more and more dividend is paid. This is applicable to A Ltd.

(*ii*) If r<k, share value increases when more and more dividend is paid. This is applicable to C Ltd.

(*iii*) If r=k, then dividend amount does not affect share value. This is applicable to B Ltd.

OR

Under MM Model, the Market Price of the share, P_o is defined as:

$$P_0 = \frac{1}{1+k_e}(D_1 + P_1)$$

Expected Market Price after 1 year, if dividend is not declared:

$P_1 = P_0(1+k_e)-D_1$

= ₹15(1+.12)=₹16.80

Expected Market Price after 1 year, if dividend of ₹1 is declared:

$P_1 = P_0(1+k_e)-D_1$

= ₹15(1+.12)-₹1=₹15.80

No. of shares to be issued:

(₹ in 00,000)

	Dividend Nil	**Dividend ₹1**
Net Income	200	200
Total Dividend	—	100
Retained Earnings	200	100
Investment Budget	200	200
Amount to be Raised	—	100
Market price (per share)	16.80	15.80
No. of shares to be issued	NIL	6,32,911
Existing shares	100,00,000	100,00,000
Total shares	100,00,000	106,32,911

	Dividend Nil	Dividend ₹1
Market Price	₹16.80	₹15.80
Total Value of the Firm	₹16,80,00,000	₹16,80,00,000

So, value of the firm is unaffected by the amount of dividend payable:

Q.5 (b) Calculation of WACC on existing capital structure:

Cost of Equity, k_e = $(D_1 \div P_0)+g$

= (₹2÷₹20)+.07=17%

Cost of Pref. Share Capital = 10%

Cost of Debentures, k_d = 14 (1–.5)=7%

Source	Amount	BV Weights	Spec. C-C	W× Spec.C/C
Equity	₹40,00,000	0.500	.17	.0850
10% Preference	10,00,000	0.125	.10	.0125
14% Debentures	30,00,000	0.375	.07	.0263
	80,00,000	1.000		.1238

So, WACC of the firm is 12.38%.

Calculation of WACC after new Debt:

k_e(new)=(₹3÷₹15)+.07=27%

k_d(new) = .16(1–.5) =8%

Source	Amount	BV Weight	Spec. C-C	W× Spec.C/C
Equity	₹40,00,000	0.40	.27	.108
10% Preference	10,00,000	0.10	.10	.010
14% Debentures	30,00,000	0.30	.07	.021
16% Debentures	20,00,000	0.20	.08	.016
	1,00,00,000	1.00		.155

So, the WACC will increase to 15.5%

OR

Selling Price (SP)	50
Raw Material (50% of SP)	25
Wages (10% of SP)	5
Manufacturing Exp. (16% of SP)	8
Cost of Production	38
Selling Overheads (4% of SP)	2
Cost of Sales	40
Monthly Production (48000÷12)	4000

Statement of Estimation of Working Capital

I. Current Assets:	
Raw Material (4,000× ₹ 25×2)	₹2,00,000
Finished Goods (4,000 × ₹ 38×3)	₹4,56,000
Debtors (4,000 × ₹ 40 × 3)75%	₹3,60,000
Total Current Assets (CA)	10,16,000
II. Current Liabilities:	
Creditors (4,000×25×2)	₹2,00,000
Wages (4,000×5×1)	₹20,000
Total Current Liabilities (CL)	2, 20,000
Net Working Capital (CA–CL)	₹7,96,000
+10% Margin	79,600
Working Capital Requirement	8,75,600

DELHI UNIVERSITY

B.Com (Hons.) November 2016 (Semester V)

Q 1. (*a*) "Wealth maximization is a better criterion than profit maximization." Do you agree ? Explain.

(*b*) ABC Ltd. has the following capital structure :

Particulars	Amount (₹)
Equity share capital (1,60,000 shares of ₹ 100 each)	1,60,00,000
12% Preference Shares	16,00,000
10% Debentures	24,00,000

The equity shares of the company are quoted at ₹ 110 and the company is expected to declare a dividend of ₹ 15 per share. Rate of growth of dividend is 8%, which is expected to be maintained.

(*i*) Assuming the tax rate of 40%, calculate WACC using book value weights.

(*ii*) The company wants to raise the additional term loan of ₹ 20,00,000 at 10%. Calculate the revised WACC assuming the market price of equity shares has gone down to ₹ 105.

Or

(*a*) "Financial Management is concerned with the solutions of three major decisions a firm must make." Explain this statement highlighting the inter-relationship amongst these decisions.

(*b*) XYZ Ltd., has the following book value capital structure:

	(₹ crore)
Equity Capital (₹ 10 each)	15
12% Preference Capital (₹ 100 each)	1
Retained Earnings	20
11.5% Debentures (₹ 100 each)	10
11% Term Loan	12.5

The next expected divided on equity shares is ₹ 3.60 per share, the dividend per share is expected to grow at 7%. The market price per share is ₹ 40.

Preference stock, redeemable after 10 years, is currently selling at ₹ 75 per share. Debentures, redeemable after 6 years, are selling at ₹ 80 per debenture. The income-tax rate for the company is 40%.

Calculate the weighted average cost of capital by using (i) Book Value weights (ii) Market Value weights.

Q2. AC Ltd. has just installed Machine X at a cost of ₹ 4,00,000 having a useful life of 5 years with no residual value. The annual production is estimated at 1,50,000 units which can be sold at ₹ 12 per unit. Annual operating costs are estimated at ₹ 4,00,000 (excluding depreciation) at this output level. Fixed costs are estimated at ₹ 6 per unit (excluding depreciation) for the same level of output.

The company has just come across another machine Y having same useful life and capable of giving same output. Annual operating cost is expected at ₹ 3,60,000 (excluding depreciation). There will be no change in fixed cost. Capital cost of the machine is ₹ 5,00,000 with *nil* residual value.

The company cart sell the machine X at ₹ 1,00,000 but the cost of dismantling and removal will amount to ₹ 30,000. The operations with Machine X have not yet started and the company wants to sell Machine X and purchase Machine Y.

AC Ltd. provides depreciation under straight line method. Assume corporate tax at 40%. The cost of capital may be assumed at 14%.

(*a*) Advise whether the company should opt for replacement.

(*b*) Will there be any change in your view if Machine X has not been installed but the company has to select any one of the two machines.

Or

RS Ltd. wants to replace its labour intensive manufacturing facility. The company is evaluating a project to install a machining system. It is estimated that system will result in annual saving of ₹ 4,50,000 in wages, ₹ 1,50,000 in supervisory cost, ₹ 50,000 in material losses during production, ₹ 40,000 in-inventory cost and ₹ 30,000 in other operating costs.

The machining system is likely to cost ₹ 7,50,000 and will require an installation cost of ₹ 50,000. Its useful life is estimated at 5 years. To operate the system, the company requires the services of two trained operators at an annual salary of ₹ 1,50,000 each. Its annual repairs and maintenance cost is likely to ₹ 40,000. Assuming corporate and capital gains tax rate uniformly at 35% and the required rate of return at 12%, it is required to calculate :

(*i*) The relevant cash flows of the machining system.

(*ii*) Payback period

(*iii*) NPV

(*iv*) The relevant cash flows, payback and NPV assuming the machining system can be sold for ₹ 50,000 at the end of 5 years when its book value is supposed to be zero.

(*v*) The relevant cash flows, payback and NPV assuming that the depreciated book value of the system upon termination at the end of fifth year will stand at ₹ 50,000. However, it will not fetch anything *i.e.* its sales value will be zero.

Q 3. (*a*) What are similarities and dissimilarities between NPV and IRR? Which of the two methods will you prefer when they give different ranking of investment of proposals ? Why ?

(*b*) A textile company belongs to a risk class for which the appropriate P/E ratio is 10. It currently has 50,000 outstanding shares selling at ₹ 100 each. The firm is contemplating the declaration of ₹ 8 dividend at the end of the current fiscal year which has just started. Given the assumptions of MM, answer the following questions :

(1) What will be the price of the share at the end of the year (i) if dividend is not declared (ii) if divided is declared.

(2) Assuming that the firm pays the dividend, has a net income of ₹ 5,00,000 and makes new investments of ₹ 10,00,000 during the period, how many new shares must be issued.

(3) What will be the value of the firm (i) if dividend is declared (ii) if dividend is not declared.

Or

(*a*) Define cash flows. How is it different from profit? Explain the superiority of cash flows in investment decision making.

(*b*) The following information is supplied to you, about LK Ltd. :

Earnings of the company	₹ 15,00,000
Dividends paid	₹ 5,00,000
Number of issued shares	1,00,000
Price earnings ratio	10
Rate of return on investment (%)	15

(*i*) Determine the theoretical market price of the share as per Walter's Model.

(*ii*) Are you satisfied with the current dividend policy of the firm ? If not, what should be the optimal dividend payout ratio in this case? Find out the price of the share at that dividend payout ratio.

Q4. (*a*) How does Gordon's Model differ from Walter's Approach to relevance of dividends? What are their similarities?

(*b*) The cost sheet of PQR Ltd. provides the following data :

	Cost per unit
Raw Material	₹ 50
Direct Labour	20
Overheads (including depreciation of ₹ 10)	40
Total Costs	110
Profits	20
Selling Price	130

Average raw material in stock is for one month. Average material in work- in-progress is for half month. Credit allowed by suppliers: one month; credit allowed-to debtors: one month. Average time lag in payment of wages is 10 days; Average time lag in payment of overheads is 30 days. 25% of sales are on cash basis. Cash balance is expected to be ₹ 1,00,000. Finished goods lie in the warehouse for one month.

You are required to prepare a statement of the working capital needed to finance a level of the activity of 54,000 units of output. Production is carried on evenly throughout the year and wages and overheads accrue similarly. State your assumptions, if any, clearly.

Or

(*a*) Explain stable dividend policy. What is the significance of stability of dividends ?

(*b*) X Ltd. currently makes all sales on credit and offers no cash discount. It is considering a 2% cash discount for payment within 10 days. The firm's current average collection period is 60 days, sales are 2,00,000 units, selling price is ₹ 30 per unit, variable cost per unit is ₹ 20 and average cost per unit is ₹ 25 at the current sales volume.

It is expected that the change in credit terms will result in increase in sales to 2,25,000 units and the average collection period will fall to 45 days. However, due to increased sales, increased working capital required will be ₹ 1,00,000. (It does not take into account the effect on debtors). Assuming that 50% of the total sales will be on cash discount and 20% is the required return on investment, should the proposed discount be offered ?

Q 5. (*a*) What are the factors affecting the cash needs of a firm ?

(*b*) The capital structure of Z Ltd. consists of 35,000 equity shares ₹ 100 each. The authorized capital of the company is 60,000 shares. For the financial year ended 31-3-2016, particulars of production, cost and sales are as follows :

Units Produced and Sold (@ 80% level of activity)	50,000
Selling Price per unit	₹ 20
Variable Cost per unit	₹ 10
Fixed Operating Cost per unit	₹ 4

In view of emerging opportunities arising out of globalization, Z Ltd. decided to utilize full capacity to meet the additional demand for its product. This would however involve an additional capital of ₹ 15,00,000. As a result of utilisation of full capacity, variable cost will be reduced by 10% but fixed cost will go up by 10%. The additional output can be sold at the existing selling price. The possible alternative sources of finance for the required additional capital would be

(*i*) entirely by equity shares of ₹ 100 each, or

(*ii*) entirely by 6% bonds of ₹ 500 each, or

(*iii*) 50% by equity capital and 50% by 6% bonds of ₹ 500 each.

Assuming a corporate tax of 40%, which of the alternative financing scheme do you recommend ? Also, calculate all the leverages and comment.

Or

(*a*) Explain the factors having a bearing on working capital needs.

(*b*) The existing capital structure of RST Ltd. is as follows :

Particulars	**Amount (₹ lacs)**
Equity Shares (₹ 100 each)	40
Retained Earnings	10
9% Preference Shares	25
7% Debentures	25
Total	100

Company earns a return of 12% and the tax on income is 40%. Company wants to raise ₹ 25,00,000 for its expansion project for which it is considering following alternatives :

(*i*) Issue of 20,000 equity shares at a premium of ₹ 25 per share

(*ii*) Issue of sufficient number of 10% Preference Shares

(*iii*) Issue of sufficient number of 9% Debentures

Projected P/E ratios in the case of equity, preference and debenture financing are 20, 17 and 16 respectively. Which alternative will you consider to be the best ? Give reasons for your choice.

SUGGESTED ANSWERS TO PRACTICAL QUESTIONS

Q 1(b) Computation of Weighted Average Cost of Capital :

Source.	Weights(W)	C/C	W×C/C	
Equity Shares	.80	.2164	.1731	
12% Preference Shares	.08	.1200	.0096	
10% Debentures	.12	.0600	.0072	
WACC	1.00		.1899	= 18.99%

Computation of Revised Weighted Average Cost of Capital:

Source	Weights(W)	C/C	W×C/C	
Equity Shares	.7273	.2229	.1666	
12% Preference Shares	.0727	.1200	.0087	
10% Debentures	.1091	.0600	.0065	
10% Loan	.0909	.0600	.0055	
WACC	1.0000		.1873	= 18.73%

Working Notes:

1. *Cost of Equity Share Capital (Existing):*

$$k_e = \frac{D_1}{P_0} + g$$

$$= \frac{₹\,15}{₹\,110} + .08 = 21.64\%$$

2. *Cost of 10% Debentures:*

$k_d = .10(1 - .4) = .06 = 6\%$

3. *Cost of Equity Share Capital (Revised):*

$$k_e = \frac{D_1}{P_0} + g$$

$$= \frac{₹\,15}{₹\,105} + .08 = 22.29\%$$

or

(b) Calculation of WACC (BV):

Source	Amount(₹)	Weight(W)	C/C	W×C/C
Equity Capital	15.0	.256	.1600	.0410
12% of Pref. Capital	1.0	.017	.1657	.0028
Retained Earnings	20.0	.342	.1600	.0547
11.5% Debentures	10.0	.171	.1137	.0194
11% Term-Loan	12.5	.214	.0660	.0141
	58.5	1.000		.1320

So, WACC (Book Value) is 13.20%.

Calculation of WACC (MV):

Source	Mkt. Value(₹)	Weights	C/C	W×C/C
Equity Capital	60.00	.738	.1600	.1181
12% Pref. Capital	.75	.009	.1657	.0015
Retained Earnings	—	—	—	—
11.5% Debentures	8.00	.099	.1137	.1126
11% Term-loan	12.50	.154	.0660	.0102
	81.25	1.000		.2424

So, WACC(MV) is 24.24%.

Working Notes:

(*i*) *Cost of Equity Capital:*

$$k_e = \frac{D_1}{P_0} + g$$

$$= \frac{₹\,3.60}{₹\,40} + .07 = 16\%$$

(*ii*) *Cost of Pref. Share Capital :*

$$k_p = \frac{PD + (RV - P_0)/N}{(RV + P_0)/2}$$

$$= \frac{₹\,12 + (₹\,100 - ₹\,75)/10}{(₹\,100 + ₹\,75)/2} = 16.57\%$$

(*iii*) *Cost of 11.5% Debentures:*

$$k_d = \frac{\text{Int.}(1 - t) + (RV - B_0)/N}{(RV + B_0)/2}$$

$$= \frac{₹\,11.5(1 - .4) + (₹\,100 - ₹\,80)/6}{(₹\,100 + ₹\,80)/2} = 11.37\%$$

(*iv*) *Cost of 11% Term-loan:*

$k_i = .11(1 - .4) = 6.6\%$

Q2(i) Replacement Decision :

Initial Outflow :	
Cost of Machine Y	₹ 5,00,000
Less : Net Proceed from Machine X	₹ 70,000
Less : Tax saving on Loss from Machine X	
(₹ 4,00,000 – ₹ 70,000) × .4	1,32,000
	2,98,000
Subsequent Annual Inflows:	
Decrease in Operating Cost	₹ 40,000
Increase in Depreciation (₹ 1,00,000 – ₹ 80,000)	20,000
Net Increase in PBT	20,000
– Tax@ 40%	8,000
Net Increase in PAT	12,000
Add Back increase in depreciation	20,000
Net Incremental Cash Inflow	32,000
Net Present Value :	
PV of Inflows (₹ 32,000 × $PVAF_{(14,5)}$)	
= (₹ 32,000 × 3.433)	₹ 109,856
Outflow	2,98,000
NPV	–1,88,144

As the NPV is negative, the firm should not go for replacement.

(ii) In case the firm had not installed Machine X but has to decide between X and Y :

Incremental Outflow of Machine Y (₹ 5,00,000 – 4,00,000)	₹ 1,00,000
PV of Incremental Inflows (calculated above)	1,09,856
Net Present Value	9,856

Machine Y should be preferred over Machine X

Or

(i) Calculation of Relevant Cash flows:

Initial Outflow:

Cost of new system	₹ 7,50,000
Add : Installation cost	50,000
	₹ 8,00,000

Subsequent Annual Cash flow :

Depreciation (₹ 8,00,000 ÷ 5)			₹ 1,60,000
Trained Operators (₹ 150,000 × 2)			3,00,000
Annual Repairs			40,000
			5,00,000
Less : Savings in Wages		₹ 4,50,000	
Savings in Supervisory		1,50,000	
Savings in Materials		50,000	
Savings in Inventory		40,000	
Savings in Other Costs		30,000	7,20,000
Net increase in PBT			2,20,000
Less : Tax @ 35%			77,000
Net Increase in PAT			1,43,000
Add back depreciation			1,60,000
Net Annual Inflow			3,03,000

(ii) Payback Period:

$$\text{PB Period} = \frac{₹\ 8,00,000}{₹\ 3,03,000} = 2.64 \text{ years}$$

(iii) Net Present Value :

PV of Inflows (₹ 3,03,000 × $PVAF_{(12,5)}$) (₹ 3,03,000 × 3.605)	₹ 10,92,315
Less: Initial Outflow	8,00,000
Net Present Value	2,92,315

(iv) In Case the system can be sold for ₹ 50,000 at the end of 5 years, the Initial and Annual Inflows will not change, but Terminal Inflows would be:

Terminal Inflow : Sale Price	₹ 50,000
Less : Tax on Profit (50,000 × .35)	17,500
Net Terminal Inflow	32,500

In this case, the Payback Period will remain same but the NPV will be :

PV of Terminal Inflow (₹ 32,500 × $PVF_{12,5)}$) (₹ 50,000 × .567)	₹18,428
New NPV (₹ 2,92,315 + ₹ 18,428)	₹ 3,10,743

(v) In case the system does not have any scrap value, there will be a loss of ₹ 50,000 after 5 years. Net Cash Inflow from tax savings would be :

Tax Savings (₹ 50,000 × .35)	₹ 17,500

There would be no change in Pay Back Period but new NPV would be:

PV of Tax Savings (₹ 17,500 × .567)	₹ 9,923
New NPV will be (₹ 2,92,315 + ₹ 9,923)	₹ 302,238

Q 3(b) Market Price after One Year :

If Dividend is declared:

$$P_1 = P_0(1 + k_e) - D_1$$
$$= ₹\ 100(1 + .10) - 8 = ₹\ 102$$

If Dividend is not declared :

$$P_1 = P_0(1 + k_e) - D_1$$
$$= ₹\ 100(1 + .10) - 0 = ₹110$$

Calculation of No. of shares to be issued:

	Dividend Declared	Dividend Not Declared
Net Income	₹ 5,00,000	₹ 5,00,000
–Dividend	4,00,000	—
Retained Earnings	1,00,000	5,00,000
–Investment	10,00,000	10,00,000
Fresh Fund required	9,00,000	5,00,000
Market Price	102	110
New shares to be issued	8824	4546
Total Shares after 1 year	58,824	54,546
Market Price P_1	102	110
Total Value of the Firm	₹ 60,00,000	₹ 60,00,000

Or

Calculation of theoretical Market Price :

Earnings per share (₹ 15,00,000 ÷ 1,00,000)	₹ 15
Dividend per share (₹ 5,00,000 ÷ 1,00,000)	₹ 5
$k_e = (1 \div PE) = (1 \div 10)$	.10
Rate of Return (r)	.15

$$P_0 = \frac{D}{k_e} + \frac{\frac{r}{k}(E - D)}{k_e}$$

$$= \frac{₹\ 5}{.10} + \frac{\frac{.15}{.10}(15 - 5)}{.10} = ₹\ 200$$

As the rate of return of the firm is 15% and Equity Capitalization Rate is only 10%, the company is not following an optional dividend policy. The company should not pay any dividend. In such situation, the market price of the share would be:

$$P_0 = \frac{D}{k_e} + \frac{\frac{r}{k_e}(E - D)}{k_e}$$

$$= \frac{0}{.10} + \frac{\frac{.15}{.10}(15 - 0)}{.10} = ₹\ 225$$

Q 4(b) Statement of Working Capital Requirement :

Current Assets:

Cash Balance	₹ 1,00,000	
RM(4,500 × 1 × ₹ 50)	2,25,000	
WIP-RM (4,500 × ½ × ₹ 50)	1,12,500	
-Wages (4,500 × ½ × ₹ 20) 50%	22,500	
-OH (4,500 × ½ × ₹ 30) 50%	33,750	
FG (4,500 × 1 × ₹ 100)	4,50,000	
Debtors (4,500 × 75% × 1 × ₹ 100)	3,37,500	12,81,250
Current Liabilities :		
Creditors (4,500 × 1 × ₹ 50)	₹ 2,25,000	
Wages (4,500 ×⅓ × ₹ 50)	75,000	
OH (4,500 × 1 × ₹ 30)	1,13,500	4,13,500
Net Working Capital (CA – CL)		8,67,750

Or

Evaluation of Discount offer:

	Existing	After Cash Discount
Sales @ ₹ 30 each (A)	60,00,000	₹ 67,50,000
Less : Variable Cost @ ₹ 20	40,00,000	45,00,000
Fixed Cost	10,00,000	10,00,000
Total Cost (B)	50,00,000	55,00,000
Surplus (A – B) = (C)	10,00,000	12,50,000
Average Collection Period	60 days	45 days
Average Debtors at Cost	8,33,333	₹ 6,87,500
Working Capital	—	1,00,000
Funds Blocked	8,33,333	7,87,500
Cost of Financing @20%	1,66,667	1,57,500
Cash Discount	—	67,500
Total Cost (D)	1,66,667	2,25,000
Net Surplus (C – D)	8,33,333	10,25,000

As the surplus is expected to increase, the firm may go for offering cash discount to customers.

Q 5(b) Calculation of Leverages, *etc:*

	Existing	New		
		Equity	Debt	Equity + Debt
Sales (Units)	50,000	62,500	62,500	62,500
Sales (₹)	10,00,000	12,50,000	12,50,000	12,50,000
– Variable Cost @ ₹ 10/₹ 9	5,00,000	5,72,500	5,72,500	5,72,500
Contribution	5,00,000	6,77,500	6,77,500	6,77,500
– Fixed Cost	2,00,000	2,20,000	2,20,000	2,20,000
EBIT	3,00,000	4,57,500	4,57,500	4,57,500
– Interest	—	—	90,000	45,000
Profit before tax	3,00,000	4,57,500	3,67,500	4,12,500
– Tax @40%	1,20,000	1,83,000	1,47,000	1,65,000
Profit after tax	1,80,000	2,74,500	2,20,500	2,47,500
No. of Equity Shares	35,000	50,000	35,000	42,500
Earnings per Shares (₹)	5.14	5.49	6.30	5.82
OL = (Contribution ÷ EBIT)	1.667	1.481	1.481	1.481
FL = (EBIT ÷ PBT)	1.000	1.000	1.245	1.109
CL = (OL × FL)	1.667	1.481	1.843	1.642

Or

Existing Financing	₹ 1,00,00,000
New Financing	25,00,000
Total Financing	1,25,00,000
Rate of Return	12%
New EBIT	15,00,000

	Case I	Case II	Case III
EBIT	₹ 15,00,000	₹ 15,00,000	₹ 15,00,000
Less Interest @7%	1,75,000	1,75,000	1,75,000
Less Interest @9%	—	—	1,75,000
Profit before tax	13,25,000	13,25,000	11,50,000
Less Tax @40%	5,30,000	5,30,000	4,60,000
Profit after tax	7,95,000	7,95,000	6,90,000
– Pref. Div. @9%	2,25,000	2,25,000	2,25,000
– Pref. Div. @10%	—	2,50,000	—
Net Profit for Equity	5,70,000	3,20,000	4,65,000
No. of Equity Shares	60,000	40,000	40,000
Earnings per Shares	₹ 9.50	₹ 8.00	₹ 11.63
PE Ratio	20	17	16
MP of Equity Shares	₹ 190	₹ 136	₹ 186.08

As the market price of equity after expansion is expected to be maximum in all equity financing, the firm should go for it.

DELHI UNIVERSITY

B.Com (Hons.), November 2017, (Semester V)

Q1. (*a*) Explain the traditional methods of evaluating long term projects.

(*b*) A company is planning to replace a machine which is required for 4 more years. Its book value is ₹ 1,60,000 and it will be fully depreciated at the end of 4 years. It will generate revenue of ₹ 5,20,000 per year for 4 years and incur expenses of ₹ 3,80,000 per year. Its salvage value now is ₹ 1,20,000 which will become zero after 4 years. It can be replaced by a machine costing ₹ 4,80,000. The new machine is expected to generate revenue of ₹ 9,20,000 per year and incur annual expenses of ₹ 5,80,000. Additional working capital of ₹ 2,00,000 will be required if new machine is bought. Depreciation on new machine will be charged at the rate of ₹ 80,000 per year to make its book value equal to its expected salvage value of ₹ 1,60,000 at the end of the fourth year. Tax rate for the company is 30% and cost of capital is 15%. Advise the company about the replacement.

Or

(*a*) Certainty equivalent approach is theoretically superior to the Risk adjusted discount rate. Do you agree?

(*b*) A company is considering a proposal for production of a new product. The company expects to sell 1,00,000 units of the new product each year at a selling price of ₹ 5 per unit. Variable cost will be ₹ 2 per unit. Regardless of the level of production, the company will incur cash cost of ₹ 50,000 per year if project is undertaken. The machine for making of the product will cost ₹ 5,00,000 and can be sold for ₹ 60,000 after the end of its life of 5 years. Additional working capital required will be ₹ 50,000. Overhead cost allocated to the new product will be ₹ 24,000 per year. Tax rate is 30% and cost of capital for the company is 15%. The company charges depreciation at 25% of the written down value. Should the company buy the new machine?

Q2. (*a*) Retained earnings are free of cost. Do you agree?

(*b*) Following is the capital structure of XYZ Ltd.:

Equity Share Capital	
(face value ₹ 10 each)	₹ 15,00,000
8% Debentures (Face value ₹ 100)	₹ 4,00,000
12% Preference shares (Face value ₹ 100)	₹ 4,00,000
10% Term Loan	₹ 7,00,000
	₹ 30,00,000

The company paid a dividend of ₹ 3 per share last year. The dividends are expected to grow at 5% per annum. Tax rate applicable to the company is 30%. All securities are traded in the capital market and the recent market prices are:

Equity Shares	₹ 15
Debentures	₹ 80
Preference Shares	₹ 100

Find out the Weighted Average Cost of Capital using book value weights and market value weights.

Or

(*a*) Profit maximisation is a better criterion than wealth maximisation. Do you agree? Explain.

(*b*) A company earns a profit of ₹ 3,00,000 per annum after meeting its interest liability of ₹ 1,20,000 on 12% debentures. The tax rate is 30%. The number of equity shares of ₹ 10 each is 80,000 and retained earnings amount to ₹ 12,00,000. The company proposes to take up an expansion scheme for which a sum of ₹ 4,00,000 is required. It is anticipated that after expansion, the company will be able to achieve the same return on investment as at present. The funds required for expansion can be raised either through debt at the rate of 12% or by issuing equity shares at par. You are required to:

(*i*) Compute the earning per share, if:

- the additional funds were raised as debt
- the additional funds were raised by issue of equity shares

(*ii*) Advise the company as to which source of finance is preferable.

Q3. (*a*) Explain the relevance of time value of money in financial decision making.

(*b*) Two companies X and Y belong to the same risk class. They have everything in common except that firm Y has 12.5% debentures of ₹ 12,00,000. Following information about the two firms is available to you:

Particulars	**X**	**Y**
Net Operating Income	₹ 3,00,000	₹ 3,00,000
12.5% Debentures	–	₹ 12,00,000
Equity Capitalization Rate	0.15	0.16

Calculate the value of two firms and explain how under Modigliani-Miller approach, an investor who owns 10% equity shares of the overvalued firm will be better off by switching his holding to the other firm. Also explain when arbitrage process will come to an end.

Or

(*a*) Discuss the main decisions which are taken in financial management.

(*b*) The capital structure of Greaves Ltd. consists of the following:

Equity shares of ₹ 10 each	₹ 40,00,000
10% Preference shares of ₹ 100 each	₹ 30,00,000
12% Secured Debentures of ₹ 100 each	₹ 20,00,000

The net sales for the company were ₹ 1.6 crores. EBIT is estimated to be 10% of sales. Corporate tax rate is 40%. Fixed cost is estimated to be ₹ 50,00,000.

(*i*) Draw the Income Statement of Greaves Ltd.

(*ii*) Calculate the Operating and Financial Leverages.

(*iii*) What will be the % change in EPS if EBIT rises by 10%? What will be the new EPS ?

Q4. (*a*) Explain the Baumol's Model of cash management.

(*b*) A company has an annual sale of ₹ 10 lakhs and average collection period is 45 days. The company is considering shift in its credit policy. Following information is available:

Variable cost is 60% of sales. Fixed cost is ₹ 2 lakhs per annum. Current bad debts are 1%. Required return on investment is 20%.

The following are the estimates of different credit policies:

Credit Policy	Average Collection Period	Increase in Sales	Bad debts
A	60 days	₹ 50,000	2%
B	75 days	₹ 80,000	3%
C	85 days	₹ 1,00,000	4%

Determine which credit policy the company should adopt.

Or

(*a*) Discuss various sources of working capital finance.

(*b*) From the following information calculate:

(*i*) The operating cycle in days. Assume 360 days in a year.

(*ii*) The amount of working capital required.

Annual consumption of Raw Material	₹ 15,00,000
Total purchases	₹ 16,00,000
Total Cost of Production	₹ 25,00,000
Total Cost of Goods Sold	₹ 28,00,000
Total Cost of Sales	₹ 30,00,000
Total Sales	₹ 36,00,000
Average Stock	
Raw Material	₹ 2,50,000
Work in progress	₹ 1,50,000
Finished Goods	₹ 3,50,000
Average Debtors	₹ 3,50,000
Average Creditors	₹ 2,50,000

Q5. (*a*) Explain the Gordon's Model of relevance of dividend.

(*b*) Ashley International started a year ago with an equity capital of ₹ 20,00,000. Other relevant details are given below:

Number of outstanding shares	20,000
Earnings of the company	₹ 2,00,000
Dividend paid	₹ 1,50,000
P/E ratio	12.5

(*i*) What is the dividend payout ratio of the company? What is the market price of the share at this payout ratio? Is the dividend payout ratio optimal according to Walter's model?

(*ii*) What is the P/E Ratio at which dividend payout ratio will have no effect on value of share?

(*iii*) What will be your decision if P/E Ratio is 8?

Or

(*a*) What is stock dividend? What is its rationale?

(*b*) A company has a capital of ₹ 100 lakhs with shares of ₹ 100 each. The shares are currently quoted at par in the market. The company is planning to declare a dividend of ₹ 6 per share at the end of current financial year which has just started. The rate of capitalization for the risk class to which the company belongs is 10%. Using the MM Approach answer the following:

(*i*) Calculate the price of the share at the end of year if:

(1) Dividend is declared.

(2) Dividend is not declared.

(*ii*) Calculate the number of shares to be issued assuming the company pays dividend, has net income of ₹ 10 lakhs and makes new investment of ₹ 20 lakhs during the year.

(*iii*) Find out the value of the firm if:

(1) Dividend is declared.

(2) Dividend is not declared.

SUGGESTED ANSWERS TO PRACTICAL QUESTIONS

Q1(b). Initial Outflows :

Cost of New machine	₹ 4,80,000
+ Increase in Working Capital	2,00,000
–Salvage Value of Existing	1,20,000
–Tax benefit on Sale of Existing (1,60,000 – 1,20,000) × 30%	12,000
Net Initial Outflow	5,48,000

Subsequent Annual Inflows :

Increase in Annual Revenue	₹ 4,00,000
Less : Increase in Expenses	2,00,000
Less : Increase in Depreciation	40,000
Increase in Profit before Tax	1,60,000
Less : Tax @ 30%	48,000
Increase in Profit after Tax	1,12,000
+Depreciation	40,000
Increase in Annual Cash Flow	1,52,000

Terminal Inflow :

Salvage Value of New Machine	₹ 1,60,000
+ Release of Working Capital	2,00,000
	3,60,000

Calculation of Net Present Value :

PV of Annual Inflows (1,52,000 × $PVAF_{(15,4)}$)	
(1,52,000 × 2.855)	₹ 4,33,960
PV of Terminal Inflows (3,60,000 × $PVF_{15,4}$)	
(3,60,000 × .572)	2,05,920
Total Present Value	6,39,880
Less : Initial Outflow	5,48,000
Net Present Value	91,880

As the NPV of the Replacement proposal is positive, the Company can proceed ahead.

OR

Initial Outflows :

Cost of New Machine	₹ 5,00,000
+ Additional Working Capital	50,000
	5,50,000

Subsequent Annual Inflows :

(Figures in ₹)

	Y1	Y2	Y3	Y4	Y5
Total Sales	5,00,000	5,00,000	5,00,000	5,00,000	5,00,000
–Variable Cost	2,00,000	2,00,000	2,00,000	2,00,000	2,00,000
–Cash Cost	50,000	50,000	50,000	50,000	50,000
–Depreciation	1,25,000	93,750	70,312	52,734	39,551
Profit before Tax	1,25,000	1,56,250	1,79,688	1,97,266	2,10,449
–Tax @ 30%	37,500	55,875	53,906	59,180	63,135
Profit after Tax	87,500	1,00,375	1,25,782	1,38,086	1,47,314
+Depreciation	1,25,000	93,750	70,312	52,734	39,551
Annual Cashflow	2,12,500	1,94,125	1,96,094	1,90,820	1,86,865
$PVF_{(15, n)}$	.870	.756	.658	.572	.497
Present Value	1,85,136	1,46,759	1,29,030	1,09,149	92,872
Total Present Value					6,62,946

Terminal Inflow:

Written Down Value of Machine	₹ 1,18,653
Less : Salvage Value	60,000
Loss on Sale	58,653
Tax Benefit @ 30% on Loss	17,596
Release of Working Capital	50,000
Total Inflow (₹ 60,000 + 17,596 + ₹ 50,000)	₹ 1,27,596
× $PVF_{(15,5)}$	.497
Present Value	63,415

Calculation of Net Present Value :

PV of Annual Inflows	₹ 6,62,946
Add : PV of Terminal Inflow	63,415
Less : Initial Outflow	5,50,000
Net Present Value	1,76,361

Decision : As the NPV of the New machine is positive, company can go for its installation:

Note : As the Overhead Costs are allocated, these are not being considered for the new machine.

Q2(b). Calculation of Specific Cost of Capital :

Cost of Debt :

$$k_d = \frac{\text{Int.}(1-t)}{B_0} \times 100 = \frac{₹\,8(1-.3)}{₹\,80} \times 100 = 7\%$$

Cost of Preference Share Capital :

$$k_P = \frac{PD}{P_0} \times 100 = \frac{₹\,12}{₹\,100} \times 100 = 12\%$$

Cost of Equity Share Capital :

$$k_e = \frac{D_1}{P_0} + g = \frac{₹\,3.15}{₹\,15} + .05 = 26\%$$

Cost of Term loan :

$$k_d = \frac{\text{Int}(1-t)}{\text{Amount}} \times 100 = \frac{₹\,10(1-.3)}{₹\,100} = 7\%$$

Calculation of Cost of Capital (Book Value Weights):

Source	Amount	Weight	Sp. c/c	Wx Sp. c/c
Equity Cap.	₹ 15,00,000	.500	.26	.130
Pref. Cap.	4,00,000	.133	.12	.016
8% Deb.	4,00,000	.133	.07	.009
10% Loan	7,00,000	.234	.07	.016
	30,00,000	1.000		.171

Calculation of Cost of Capital (Market Value Weights) :

Source	Market Value	Weight	Sp c/c	Wx Sp. c/c
Equity Cap.	₹ 22,50,000	.613	.26	.1594
Pref. Cap.	4,00,000	.109	.12	.0131
8% Deb.	3,20,000	.087	.07	.0061
10% loan	7,00,000	.191	.07	.0134
	36,70,000	1.000		.1920

So, WACC (BV) is 17.1% and WACC (MV) is 19.2%

OR

Profit at Present (before interest)		₹ 4,20,000
Capital Funds at present	: Equity Share Capital	₹ 8,00,000
	12% Debt	10,00,000
	Retained Earnings	12,00,000
		30,00,000
Rate of Return (₹ 4,20,000 ÷ ₹ 3,00,000)		14%
New Funding		₹ 4,00,000
Return on New Funding (₹ 4,00,000 × 14%)		56,000
Total Return after expansion (₹ 4,20,000 + ₹ 56,000)		4,76,000

Calculation of Earnings per Share :

	Issue of Debt.	Issue of Capital
Funds required	₹ 4,00,000	₹ 4,00,000
No. of new shares	—	40,000
Total Equity Shares	80,000	1,20,000
Total Profit before interest	₹ 4,76,000	₹ 4,76,000
Less : Interest (Old + New)	1,68,000	1,20,000
Profit before Tax	3,08,000	3,56,000
Less : Tax @ 30%	92,400	1,06,800
Profit after Tax	2,15,600	2,49,200
No. of Equity Shares	80,000	1,20,000
Earnings per Share	₹ 2.70	₹ 2.08

Raising new funds by issue of 12% Debt is advised.

Q3(b). Calculation of Values of the Firms :

	X Ltd.	Y Ltd.
Net Operating Income	₹ 3,00,000	₹ 3,00,000
Less : Interest	—	1,50,000
Net Profit for Equity Shareholders	3,00,000	1,50,000
Equity Capitalization Rate	15%	16%
Value of Equity, V_E	₹ 20,00,000	₹ 9,37,500
Add : Value of Debt, V_D	—	12,00,000
Value of the firm	20,00,000	21,37,500

Arbitrage under M-M Model :

Sale of 10% Equity of Y Ltd.	₹ 93,750
+12.5 % Loan	1,20,000
Total Funds	2,13,750
–10% Equity in × Ltd.	2,00,000
Capital Funds saved	13,750

Analysis of Income of the Investor :

	X Ltd.	Y Ltd.
Dividends	₹ 30,000	₹ 15,000
–Interest	15,000	—
Net Income	15,000	15,000

Though there is no change in income of the investor after Arbitrage, but yet he is benefited because he is having capital funds of ₹ 13,750 with him, which can be invested elsewhere to get some return.

The arbitrage process will come to an end when the market price of Y Ltd. gradually goes down whereas that of X Ltd. goes up, and thereby the arbitrage profit evaporates.

OR

Income Statement of Greaves Ltd. :

Net Sales	₹ 1,60,00,000
% EBIT	10%
So, EBIT	₹ 16,00,000
Add : Fixed Cost	50,00,000
Contribution	66,00,000
So, Variable Cost	94,00,000
EBIT	₹ 16,00,000
Less : Interest	2,40,000
Profit before Tax	13,60,000
Less : Tax @ 40%	5,44,000
Profit after Tax	8,16,000
Less : Preference Dividend	3,00,000
Net Profit for Equity Shareholders	5,16,000
No. of Equity Shares	4,00,000
Earnings per Share	₹ 1.29

$$\text{Operating Leverage} = \frac{\text{Contribution}}{\text{EBIT}} = \frac{₹\ 66,00,000}{₹\ 16,00,000} = 4.125$$

$$\text{Financial Leverage} = \frac{\text{EBIT}}{\text{PBT} - \frac{\text{PD}}{(1-t)}} = \frac{₹\ 16,00,000}{13,60,000 - \left(\frac{3,00000}{1-.40}\right)}$$

$$= 1.860$$

So, if EBIT increases by 10%, EPS will increase by 18.60%. It can be verified as follows :

EBIT (after 10% increase)	₹ 17,60,000
–Interest	2,40,000
PBT	15,20,000
–Tax@40%	6,08,000
PAT	9,12,000
–PD	3,00,000
NP for Equity Shares holders	6,12,000
No. of Equity Shares	4,00,000
New EPS	₹ 1.53
% Increase in EPS (1.53 ÷ 1.29)	18.60%

Q4(b). Evaluation of Credit Policies : (No. of days 360 a year)

Credit Period	45 days	60 days	75 days	85 days
Sales (1)	₹ 10,00,000	₹ 10,50,000	₹ 10,80,000	₹ 11,00,000
Variable Cost@60%	6,00,000	6,30,000	6,48,000	6,60,000
Fixed Cost	2,00,000	2,00,000	2,00,000	2,00,000
Total Cost (2)	8,00,000	8,30,000	8,48,000	8,60,000
Surplus (1-2)=3	2,00,000	2,20,000	2,32,000	2,40,000
Av. Debtors at Cost	1,00,000	1,38,333	1,76,667	2,03,056
Finance Cost@20%	20,000	27,667	35,333	40,611
Bad Debt (1/2/3/4)	10,000	21,000	32,400	44,000
Total Cost (4)	30,000	48,667	67,733	84,611
Net Income (3-4)	1,70,000	1,71,333	1,64,267	1,55,389

The Company may change the credit period from 45 days to 60 days to increase the profit.

OR

Calculation of Operating Cycle :

$$\text{RMCP} = \frac{\text{Av.RM}}{\text{RM consumed}} \times 360 = \frac{2,50,000}{15,00,000} \times 360 = 60 \text{ days}$$

$$\text{WPCP} = \frac{\text{Av. WIP}}{\text{Annual Cost}} \times 360 = \frac{1,50,000}{25,00,000} \times 360 = 22 \text{ days}$$

$$\text{FGCP} = \frac{\text{Av. Stock}}{\text{Annual COGS}} \times 360 = \frac{3,50,000}{28,00,000} \times 360 = 45 \text{ days}$$

$$\text{RCP} = \frac{\text{Av. Debtors}}{\text{Credit Sales}} \times 360 = \frac{3,50,000}{36,00,000} \times 360 = 35 \text{ days}$$

Gross Operating Cycle	162 days
$\text{DP} = \frac{\text{Av. Creditors}}{\text{Credit Purchases}} \times 360 = \frac{2,50,000}{16,00,000} \times 360 = 56$ days	
Net Operating Cycle	106 days

Calculation of Working Capital Requirement :

Current Assets:	
Average RM	₹ 2,50,000
Average WIP	1,50,000
Average FG	3,50,000
Average Debtors	3,50,000
Total	11,00,000
Current Liabilities :	
Average Creditors	2,50,000
Working Capital (CA – CL)	8,50,000

Q5(b).

(i) $k_e = \frac{1}{PE} = \frac{1}{12.5} = .8 = 8\%$

r = ₹ 2,00,000 ÷ ₹ 20,00,000 = 10%

EPS of the Company (₹ 2,00,000 ÷ 20,000)	₹ 10.00
DPS (₹ 1,50,000 ÷ 20,000)	7.50
So, DP Ratio (₹ 7.50 ÷ ₹ 10)	75%

MP as per Walter's Model :

$$P_0 = \frac{D}{k_e} + \frac{\frac{r}{k_e}(E - D)}{k_e} = \frac{₹7.50}{0.08} + \frac{\frac{.10}{.08}(10 - 7.50)}{.08}$$

= ₹ 93.75 + ₹ 39.06 = ₹ 132.81

As per Walter's Model, the DP Ratio of 75% is not Optimal. The reason being that r(10%) > k_e (8%), and higher market price can be achieved by paying lesser dividend.

(ii) The PE Ratio of 10 will have no effect on the market price of the share as the k_e = 10% and k_e = r = 10%. Under Walter's Model, the DP ratio has no effect on the MP if $r = k_e$.

(iii) In case PE Ratio is 8, the k_e would be 12.5 and 'r' is 10%. As $r < k_e$, the MP can be increased by retaining lesser and paying more dividend. In such a case, the MP can be increased by distributing dividend which is more than ₹ 7.50.

OR

(i) Under MM Model, the MP at the end of the year can be found as follows:

If Dividend of ₹ *6 is declared :*

$P_1 = P_0 (1 + k_e) - D_1$

= ₹ 100 (1 + .10) – ₹ 6 = ₹ 104

If Dividend of ₹ *6 is not declared :*

= ₹ 100 (1 + .10) – 0 = ₹ 110.

(ii) No. of equity shares to be issued:

Total Earnings for the year	₹ 10,00,000
Less : Dividend payable (1,00,000 × ₹ 6)	6,00,000
Retained Earnings	₹ 4,00,000
Total Funds Required	20,00,000
New Fresh Funds required	16,00,000
MP of the Share (P_1)	₹ 104
No. of Shares to be issued (₹ 16,00,000 ÷ ₹ 104)	15,385

(iii) Current Value of the firm

If Dividend is declared :

$$nP_0 = \frac{1}{1 + k_e} ((n + m) P_1 - I + E)$$

$$= \frac{1}{1.10} ((1,00,000 + 15,385) 104 - 20,00,000 + 10,00,000)$$

= ₹ 1,00,00,000

If Dividend is not declared :

New Equity Shares to be issued (₹ 10,00,000 ÷ ₹ 110) = 9091

$$nP_0 = \frac{1}{1 + .10} ((1,00,000 + 9,091) 110 - 20,00,000 + 10,00,000)$$

= ₹ 1,00,00,000.

DELHI UNIVERSITY

B.Com (H.), November, 2018 (Semester V)

Q1. (*a*) "Financial management has expanded in its scope during last few decades." Discuss and contrast the salient features of the traditional and modern approaches to financial management.

(*b*) The income statement of PQR Ltd. for the current year is as follows :

Particulars	Amount (₹)	Amount (₹)
Sales		7,00,000
Less : Costs		
Materials	2,00,000	
Labour	2,50,000	
Other Operating costs	80,000	
Depreciation	70,000	
Total		6,00,000
Earnings Before Interest and Taxes (EBIT)		1,00,000
Less : Taxes @ 40%		40,000
Earnings after Tax (EAT)		60,000

The plant manager proposes to replace an existing machine by another machine costing ₹ 2,40,000. The new machine will have 8 years life having no salvage value. It is estimated that' new machine will reduce the labour cost by ₹ 50,000 per year. The old machine will realize ₹ 40,000. Income statement does not include the depreciation on old machine (the one that is going to be replaced) as the same had been fully depreciated for tax purposes last year though it will still continue to function, if not replaced, for a few years more. It is believed that there will be no change in other expenses and revenues of the firm due to this replacement. The company requires an after-tax return of 12%. The rate of tax applicable to company's income is 40%. Suggest whether the company should buy the new machine, assuming that the company follows straight line method of depreciation and the same is allowed for tax purposes.

Or

(*a*) "Wealth maximisation" is only a decision criterion and not a goal of a firm. Explain.

(*b*) EFG Technology Ltd. is considering a new project for manufacturing of solar energy games kit involving a capital expenditure of ₹ 600 lakh and working capital of ₹ 150 lakh. The plant has capacity of annual production of 12 lakh units and capacity utilisation during 6-years working life of the project is expected to be as mentioned below :

Year	Capacity Utilisation (%)
1	33.33
2	66.67
3	90
4	100
5	100
6	100

The average price per unit of product is expected to be ₹ 200 netting a contribution of 40%. The annual fixed costs, excluding depreciation, are estimated to be ₹ 480 lakh per annum from the third year onwards; for the first year and second year, it would be ₹ 240 lakh and ₹ 360 lakh respectively. Depreciation is charged @ 33.33% on the basis of written down value (WDV) method. The rate of income tax may be taken as 35%. The cost of capital is 15%.

At the end of third year, an additional investment of ₹ 100 lakh would be required for working capital. Terminal value of fixed assets (sold as scrap) may be taken as 10% and for the current assets at 100%. Give suggestion to EFG Technology Ltd. regarding taking up the new project.

Q2. (*a*) What is capital budgeting ? "Capital Budgeting decisions are irreversible." Do you agree ? Comment.

(*b*) From the following information provided by MNO Ltd., you are required to calculate the weighted average cost of capital (k_0) using Market Value Weights. The present book value capital structure of MNO Ltd. is :

	(Amount in ₹)
Debentures (₹ 100 per debenture)	10,00,000
Preference Shares (₹ 100 per share)	5,00,000
Equity Shares (₹ 10 per share)	20,00,000
Retained Earnings	5,00,000
	40,00,000

All these securities are traded in the capital markets. Recent prices are : debentures @ ₹ 110, preference shares @ ₹ 120 and equity shares @ ₹ 22. Anticipated external financing opportunities are :

(*i*) ₹ 100 per debentures redeemable at par : 20-year maturity, 8% coupon rate, 4% floating costs, sale price ₹ 100.

(*ii*) ₹ 100 preference shares redeemable at par : 15-year maturity, 10% dividend rate, 5% floating costs, sale price ₹ 100.

(*iii*) Equity shares : ₹ 2 per share floating costs, sale price ₹ 22.

In addition, the dividend expected on the equity shares at the end of the year is ₹ 2 per share; the anticipated growth rate in dividends is 5% and the company has the practice of paying all its earnings in the form of dividends. The corporate tax rate is 30%.

Or

(*a*) Compare Net Present Value (NPV) with Profitability Index (PI) method of evaluating a capital budgeting proposal. Which one is better and why ?

(*b*) There are two firms A Ltd. and B Ltd. which are identical in all respects except in terms of their capital structure as can be observed from the details given below:

Particulars	A Ltd.	B Ltd.
EBIT	₹ 1,00,000	₹ 1,00,000
10% Debentures	₹ 5,00,000	—
k_e	16%	12.5 %

Calculate the value of the two firms and illustrate using MM approach how an investor holding 10% shares of A Ltd. will be benefited by switching over his investment from A Ltd. to B Ltd. When will the arbitrage process come to an end ?

Q3. (*a*) What do you mean by Agency Problem ? How can this be resolved ?

(*b*) The following is the selected financial information for the year ended 31st March, 2016 for two companies : X Ltd. and Y Ltd. :

Particulars	X Ltd.	Y Ltd.
Variable cost as Percentage of Sales	66.67	75
Interest Expense (₹)	200	300
Degree of Operating Leverage	5	6
Degree of Financial leverage	3	4
Income tax rate	35%	35%

Prepare Income Statement of both companies and also comment on their risk, position.

Or

(*a*) Why is consideration of the time value of money important in financial decision-making ? How can time be adjusted?

(*b*) From the information given below, determine the value of two firms (A Ltd. and B Ltd.) belonging to homogeneous risk class except in terms of capital structure under (*i*) Net Income approach and (*ii*) Net Operating Income approach :

Details	A Ltd.	B Ltd.
Earnings before interest and tax (EB1T)	₹ 2,25,000	₹2,25,000
Interest (0.15)	₹ 75,000	—
Equity Capitalisation Rate	0.20	
Tax rate	0.30	

Q4. (*a*) Discuss the Modigliani and Miller approach of irrelevance of dividends.

(*b*) The following, information is collected from the current year annual report of JKL Ltd. :

Earnings of firm	₹ 18 lakh
Number of equity shares	3,00,000
Return on investment	22.5%
Cost of Equity	15%

What should be the dividend payout ratio so as to keep the share price at ₹ 42 by using Walter Model ? Also, determine the optimum dividend payout ratio and the market price of shares at the optimum dividend payout ratio. What will the maximum and minimum share price under this model ?

Or

(*a*) What is "informational contents" of dividend payment ? Enumerate the main determinants of dividend policy of the firm.

(*b*) X Ltd. belongs to a risk class for which appropriate capitalisation rate is 10%. It currently has outstanding 25000 shares selling at ₹ 100 each. The firm is contemplating the declaration of dividend of ₹ 5 per share at the end of the current financial year. The company expects to have a net income of ₹ 2.5 lakh and has a proposal for making new investments of ₹ 5 lakh.

Show that under MM assumption, the payment of dividend does not affect the value of the firm. Do you think MM model is realistic with respect to valuation ?

Q5. (*a*) Explain the Miller-Orr model of cash management.

(*b*) GHI Limited is considering making its present credit policy a bit strict. The company has current annual sales of ₹ 60,00,000 and it is expected that implementation of the proposed credit policy would decrease the annual sales to ₹48,00,000. The average collection period would decrease from 60 days to 45 days. The sale price of the product is ₹ 40 and the variable cost involved in manufacturing of a product is ₹ 30. On the volume of 1,50,000 units, the average cost is ₹ 34. Assume a year comprises of 360 days. Give advice whether the proposed strict credit policy shall be implemented if the firm's required rate of return is 25%.

Or

(*a*) Briefly explain the Economic Order Quantity (EOQ) model of inventory management.

(*b*) The following information is extracted from last year's Annual accounts of ABC Ltd. :

Details	Amount per Unit (₹)
Raw Material cost	100.00
Direct labour cost	37.50
Overheads/cost	75.00
Total cost	212.50
Profit	37.50
Selling Price	250.00

The company keeps raw material in stock on an average for four weeks, work-in-progress in stock on an average for one week and finished goods in stock on an average for two weeks. The credit allowed by suppliers is three weeks and company allows four weeks credit to its debtors. The lag in payment of wages is one week and lag in payment of overhead expenses is two weeks. The company sells one-fifth of its output against cash and maintains cash in hand and at bank balance put together at ₹ 37,500.

You are required to prepare an estimate of working capital needed to finance an activity level of ₹ 1,30,000 units of production. Assume that production is carried on evenly throughout the year and overheads and wages accrue similarly. Work-in-progress stock is 80% completed in all respects.

SUGGESTED ANSWERS TO PRACTICAL QUESTIONS

Q1. (b) Initial Outflows :

Cost of new Machine	₹ 2,40,000	
Solvage Value of old	40,000	₹ 2,00,000

Subsequent Annual Inflows :

Decrease in Labour cost	₹ 50,000
Increase in Depreciation	30,000
Net increase in PBT	20,000
Less : Tax 40%	8,000
Net Increase in PAT	12,000
Add back Depreciation	30,000
Increase in Cash flows	42,000
	Nil

Terminal Inflows.

Calculation of NPV :

PV of Annual Inflows @ 12% :	
(₹ 42,000 × PVAF (12%, 8) ₹ 42,000 × 4.968)	₹2,08,656
Less : Initial Outflows	2,00,000
Net Present Value	₹ 8,656

As the NPV of replacement is positive, firm can go for new machine.

OR

Initial Outflows :

Cost of new Machine	₹ 600,00,000
Working Capital at T_0	150,00,000
PU of WC at T_3 (₹ 100,00,000 × .658)	65,80,000
	8,15,80,000

Subsequent Annual Inflows :

	Yr.1	Yr.2	Yr.3	Yr.4	Yr.5
Capacity Utilization (%)	33.33	66.67	90	100	100
Annual Production (Units)	4,00,000	8,00,000	10,80,000	12,00,000	12,00,000
Contribution @ ₹ 80 each (₹)	320,00,000	640,00,000	864,00,000	960,00,000	960,00,000
Less : Fixed Cost	240,00,000	360,00,000	480,00,000	480,00,000	480,00,0000
Less Depreciation 33.33% to DV	200,00,000	133,34,000	88,89,780	59,26,816	39,51,408
Profit before Tax	(80,00,000)	146,64,000	295,10,220	420,73,184	440,48,592
Less : Tax @ 35%	28,00,000	51,32,400	103,28,577	147,25,614	154,17,007
Profit after Tax	(52,00,000)	95,31,600	191,81,643	273,47,570	286,31,585
Add back Depreciation	200,00,000	133,34,000	88,89,780	59,26,816	39,51,408
Cash Flows	148,00,000	228,65,600	280,71,423	332,74,386	325,82,993

	Yr.1	Yr.2	Yr.3	Yr.4	Yr.5
PVF @ 15%	.870	.756	.658	.572	.497
Present Value	128,76,000	172,86,394	184,70,996	190,32,949	161,93,748
Total Present Value					838,60,087

Terminal Inflows :

Scrap Value of Fixed Assets	₹ 60,00,000
Release of WC (150 + 100)	250,00,000
Total	310,00,000
PVF (15%, 5)	.497
Present Value	154,07,000

Calculation of NPV :

PV of Annual Inflows :	₹ 838,60,087
PV of Terminal Inflows :	154,07,000
Less : Initial Outflow	815,80,000
Net Present Value	176,87,087

As the NPV of the Proposal is positive, it can be taken up.

Q2. (b) Calculation of Specific Costs of Capital :

Cost of Debt, k_d : $$k_d = \frac{\text{Int.}(1-t)}{B_0 - FC} = \frac{8(1-.3)}{100-4} = 5.83\%$$

Cost of Pref. Share k_p : $$k_p = \frac{PD}{P_0 - FC} = \frac{10}{100-5} = 10.53\%$$

Cost of Equity, k_e : $$k_e = \frac{D_1}{P_0 - FC} + g = \frac{2}{22-2} + .05 = 15\%$$

Calculation of WACC :

Source	Mkt. Value	Weight	Sp. ck	Wx Sp. ck
Equity	₹ 44,00,000	.721	.1500	.10815
Preference	6,00,000	.098	.1053	.01032
Debentures	11,00,000	.181	.0583	.01055
	61,00,000	1.000		.12902

WACC = 12.90%.

Value of the Firms :

	A Ltd.	**B Ltd.**
EBIT	₹ 1,00,000	₹ 1,00,000
Less : Interest	50,000	—
NP for Equity	50,000	1,00,000
k_e	.16	.125
Value of Equity, V_E	3,12,500	8,00,000
+Value of Debt, V_D	5,00,000	—
	8,12,500	8,00,000

Case of Investor having 10% Equity in A Ltd. :

Sale of 10% Equity in A Ltd.	₹ 31,250
+10% loan	50,000

Total Funds	81,250
10% Equity bought in B Ltd.	80,000
Fund Saved	1,250

Analysis of Revenue Income of the Investor :

	A Ltd.	**B Ltd.**
Dividends	5,000	10,000
Less : Interest		5,000
Net Income	5,000	5,000

The Investor is benefited by switching over from A Ltd. to B Ltd. as he can earn extra income by investing capital funds saved, ₹ 1,250.

Q3. (b) Calculation of EBIT :

	X Ltd.	**Y Ltd.**
Financial leverage (given)	3	4
Interest (₹)	200	300
FL	$\frac{\text{EBIT}}{\text{EBIT} - \text{Int.}}$	$\frac{\text{EBIT}}{\text{EBIT} - \text{Int.}}$
	$\frac{\text{EBIT}}{\text{EBIT} - 200} = 3$	$\frac{\text{EBIT}}{\text{EBIT} - 300} = 4$
EBIT	= ₹ 300	= ₹ 400

Calculation of Contribution :

Operating leverage (given)	5	6
EBIT	300	400
OL	$\frac{\text{Contribution}}{\text{EBIT}}$	$\frac{\text{Contribution}}{\text{EBIT}}$
	$\frac{\text{Contribution}}{₹\ 300} = 5$	$\frac{\text{Contribution}}{₹\ 400} = 6$
Contribution	= ₹ 1500	= ₹ 2400
Fixed Cost (Cont. - EBIT)	= ₹ 1200	= ₹ 2,000
Variable Cost	66.67%	75.00%
Contribution	33.33%	25.00%
∴ Sales	₹ 4,500	₹ 9,600
Less : Variable Cost	3,000	7,200
Contribution	1,500	2,400
Less : Fixed Cost	1,200	2,000
EBIT	300	400
Less : Interest	200	300
PBT	100	100
Less : Tax 35%	35	35
PAT	65	65

Firm Y Ltd. seems to be riskier than X Ltd. as the former has higher FL, higher OL as well as higher CL.

OR

Value of the firms (NI Approach) :

	A Ltd.	**B Ltd.**
EBIT	₹ 2,25,000	₹ 2,25,000
Less : Interest	75,000	—
NP for Equity	1,50,000	2,25,000
k_e	.20	.20
Value of Equity	7,50,000	11,25,000
Value of Debt	5,00,000	—
Value of Firm	12,50,000	11,25,000

Value of the firms (NOI Approach) :

The NOI approach is based on the assumptions that there is no tax. However, in the present case, both the firms have tax liability @ 30%. So, their valuation may be found by applying the MM model (with taxes) which is an extension of NOI approach. Under the MM Model, the value of levered firm is taken as equal to the value of unlevered firm plus the premium for interest tax shield on debt financing. Thus,

$$V_L = V_U + \text{Debt}(t)$$

where, V_L refers to the value of levered firm, V_U refers to value of unlevered firm and 't' refers to the tax rate applicable to the levered firm.

Valuation of Firm Q (Unlevered Firm):

$$V_Q = \text{EBIT}(1–.3)/k_e$$
$$= ₹\ 2,25,000(.7)/.20$$
$$= ₹\ 7,87,500$$

Now, the valuation of Firm P (Levered Firm) is :

$$V_P = V_Q + \text{Debt}(t)$$
$$= ₹\ 7,87,500 + 5,00,000(.30)$$
$$= ₹\ 9,37,500$$

Q4. (b) Under Walter's Model, Price of ₹ 42 will arrive at a dividend of :

$$₹\ 42 = \frac{D}{.15} + \frac{\frac{.225}{.150}(6 - D)}{.15}$$

D = ₹ 5.40

EPS = ₹ 6.00

DP Ratio = ₹ 5.40 ÷ ₹ 6.00 = 90%

As the 'r' > 'k_e', the optimum Dividend Payout to attain maximum share price would be 'no dividend'.

Maximum MP (No Dividend) :

$$MP_0 = \frac{0}{.15} + \frac{\frac{.225}{.150}(6 - 0)}{.15}$$

= ₹ 60

Minimum MP0 (100% Payout) :

$$MP_0 = \frac{6}{.15} + \frac{\frac{.225}{.150}(6-6)}{.15}$$

= ₹ 40

OR

Value of the Firm (after one year) :

Solution :

(*a*) Existing market price share, P_0, = ₹ 100
Contemplated DPS, D_1, = ₹ 5
Rate of Capitalization, k_e, = .10
Market price as per MM approach is

$$P_0 = \frac{D_1 + P_1}{1 + k_e}$$

(*i*) If contemplated dividends are declared, then

$$₹\ 100 = \frac{5 + P_1}{1 + .10}$$

or, P_1 = ₹ 105

(*ii*) If dividends are not declared, then

$$₹\ 100 = \frac{0 + P_1}{1 + .10}$$

or, P_1 = ₹ 110

(*b*) **Calculation of number of shares to be issued:**

	Dividends Distributed	Dividends not Distributed
	₹	₹
Net Income	2,50,000	2,50,000
Total Dividends	1,25,000	—
Retained Earnings	1,25,000	2,50,000
Investment Budget	5,00,000	5,00,000
Amount to be raised by new issues	3,75,000	2,50,000
Relevant Market Price (₹ per share)	105	110
No. of new shares to be issued	3,571.4	2,272.7

(*c*) **Total number of shares at the end of the year :**

Existing shares	25,000.00	25,000.0
+New shares issued	3,571.4	2,272.7
Total shares	28,571.4	27,272.7
Market price per share (₹)	105	110
Market value of share	28,571.4 × 105 =30,00,000	27,272.7 × 110 =30,00,000

Thus, the total market value of shares remains unaffected whether dividends are distributed or not distributed at all. It may be noted that the number of the new shares to be issued have been taken exact at 3,571.4 and 2,272.4. But the shares cannot be issued in fractions. If the number of new shares to be issued is taken at integer values of 3,572 and 2,273 respectively, then the total market value of the firm would be ₹ 30,00,060 (*i.e.*, 28,572×105) and ₹ 30,00,030 (*i.e.*, 27,273 × 110), which are almost same.

Q5. (b) Comparison of Credit Policies :

	Existing	Proposed
Sales (A)	₹ 60,00,000	₹ 48,00,000
Variable Cost @ ₹ 30	₹ 45,00,000	₹ 36,00,000
Fixed Cost	6,00,000	6,00,000
Total Cost (B)	51,00,000	42,00,000
Credit Period	60 days	45 days
AV. Debtors at cost	8,50,000	5,25,000
Cost of Financing at 25% (C)	2,12,500	1,31,250
Net Surplus (A – B – C)	6,87,500	4,68,750

As the Net Surplus is more under existing policy, the firm should not change the credit policy.

OR

Annual Production	1,30,000 units
Production per week (1,30,000 ÷ 52)	2,500 units

Statement of Working Capital Requirement

I.	*Current Assets :*		
	Cash	₹ 37,500	
	RM(2,500 × 4 × 100)	10,00,000	
	WIP-RM (2,500 × 1 × 100) 80%	2,00,000	
	—W (2,500 × 1 × 37.50) 80%	75,000	
	—OH (2,500 × 1 × 75) 80%	1,50,000	
	FG (2,500 × 2 × 212.50)	10,62,500	
	Debtors (2,500 × 4 × 212.50) 80%	17,00,000	
			₹ 42,25,000
II.	*Current Liabilities :*		
	Creditors (2,500 × 3 × 100)	₹ 7,50,000	
	Wages (2,500 × 1 × 37.50)	93,750	
	OH (2,500 × 2 × 75)	3,75,000	12,18,750
	Working Capital Requirement (CA – CL)		30,06,250

MATHEMATICAL TABLES

Table A 1:*Factors for Compounded Value of a Given Amount i.e.,* $CVF_{(r\%,n)}$

Period n	*1%*	*2%*	*3%*	*4%*	*5%*	*6%*	*7%*	*8%*	*9%*	*10%*
1	1.010	1.020	1.030	1.040	1.050	1.060	1.070	1.080	1.090	1.100
2	1.020	1.040	1.061	1.082	1.102	1.124	1.145	1.166	1.188	1.210
3	1.030	1.061	1.093	1.125	1.158	1.191	1.225	1.260	1.295	1.331
4	1.041	1.082	1.126	1.170	1.216	1.262	1.311	1.360	1.412	1.464
5	1.051	1.104	1.159	1.217	1.276	1.338	1.403	1.469	1.539	1.611
6	1.062	1.126	1.194	1.265	1.340	1.419	1.501	1.587	1.677	1.772
7	1.072	1.149	1.230	1.316	1.407	1.504	1.606	1.714	1.828	1.949
8	1.083	1.172	1.267	1.369	1.477	1.594	1.718	1.851	1.993	2.144
9	1.094	1.195	1.305	1.423	1.551	1.689	1.838	1.999	2.172	2.358
10	1.105	1.219	1.344	1.480	1.629	1.791	1.967	2.159	2.367	2.594
11	1.116	1.243	1.384	1.539	1.710	1.898	2.105	2.332	2.580	2.853
12	1.127	1.268	1.426	1.601	1.796	2.012	2.252	2.518	2.813	3.138
13	1.138	1.294	1.469	1.665	1.886	2.133	2.410	2.720	3.056	3.452
14	1.149	1.319	1.513	1.732	1.930	2.261	2.579	2.937	3.342	3.797
15	1.161	1.346	1.558	1.801	2.079	2.397	2.759	3.172	3.642	4.177
16	1.173	1.373	1.605	1.873	2.183	2.540	2.952	3.426	3.970	4.595
17	1.184	1.400	1.653	1.948	2.292	2.693	3.159	3.700	4.328	5.054
18	1.196	1.428	1.702	2.026	2.407	2.854	3.380	3.996	4.717	5.560
19	1.208	1.457	1.754	2.107	2.527	3.026	3.617	4.316	5.142	6.116
20	1.220	1.486	1.806	2.191	2.653	3.207	3.870	4.661	5.604	6.728
25	1.282	1.641	2.094	2.666	3.386	4.292	5.427	6.848	8.623	10.835
30	1.348	1.811	2.427	3.243	4.322	5.743	7.612	10.063	13.268	17.449

Table A 1:*Factors for Compounded Value of a Given Amount i.e.,* $CVF_{(r\%,n)}$

Period n	*11%*	*12%*	*13%*	*14%*	*15%*	*16%*	*17%*	*18%*	*19%*	*20%*
1	1.110	1.120	1.130	1.140	1.150	1.160	1.170	1.180	1.190	1.200
2	1.232	1.254	1.277	1.300	1.322	1.346	1.369	1.392	1.416	1.440
3	1.368	1.405	1.443	1.482	1.521	1.561	1.602	1.643	1.685	1.728
4	1.518	1.574	1.630	1.689	1.749	1.811	1.874	1.939	2.005	2.074
5	1.685	1.762	1.842	1.925	2.011	2.100	2.192	2.288	2.386	2.488
6	1.870	1.974	2.082	2.195	2.313	2.436	2.565	2.700	2.840	2.986
7	2.076	2.211	2.353	2.502	2.660	2.826	3.001	3.185	3.379	3.583
8	2.305	2.476	2.658	2.853	3.059	3.278	3.511	3.759	4.021	4.300
9	2.558	2.773	3.004	3.252	3.518	3.803	4.108	4.435	4.785	5.160
10	2.839	3.106	3.395	3.707	4.046	4.411	4.807	5.234	5.695	6.192
11	3.152	3.479	3.836	4.226	4.652	5.117	5.624	6.176	6.777	7.430
12	3.498	3.896	4.335	4.818	5.350	5.936	6.580	7.288	8.064	8.916
13	3.883	4.363	4.898	5.492	6.153	6.886	7.699	8.599	9.596	10.699
14	4.310	4.887	5.535	6.261	7.076	7.988	9.007	10.147	11.420	12.839
15	4.785	5.474	6.254	7.138	8.137	9.266	10.539	11.974	13.590	15.407
16	5.311	6.130	7.067	8.137	9.358	10.748	12.330	14.129	16.172	18.488
17	5.895	6.866	7.986	9.276	10.761	12.468	14.426	16.672	19.244	22.186
18	6.544	7.690	9.024	10.575	12.375	14.463	16.879	19.673	22.901	26.623
19	7.263	8.613	10.197	12.056	14.232	16.777	19.748	23.214	27.252	31.948
20	8.062	9.646	11.523	13.743	16.367	19.461	23.106	27.393	32.429	38.338
25	13.585	17.000	21.231	26.462	32.919	40.874	50.658	32.669	77.388	95.396
30	22.892	29.960	39.116	50.950	66.212	85.850	111.065	143.371	184.675	237.376

Table A 1:*Factors for Compounded Value of a Given Amount i.e.,* $CVF_{(r\%,n)}$

Period n	*21%*	*22%*	*23%*	*24%*	*25%*	*26%*	*27%*	*28%*	*29%*	*30%*
1	1.210	1.220	1.230	1.240	1.250	1.260	1.270	1.280	1.290	1.300
2	1.464	1.488	1.513	1.538	1.562	1.588	1.613	1.638	1.664	1.690
3	1.772	1.816	1.861	1.907	1.953	2.000	2.048	2.097	2.147	2.197
4	2.144	2.215	2.289	2.364	2.441	2.520	2.601	2.684	2.769	2.856
5	2.594	2.703	2.815	2.392	3.052	3.176	3.304	3.436	3.572	3.713
6	3.138	3.297	3.463	3.635	3.815	4.001	4.196	4.398	4.608	4.827
7	3.797	4.023	4.259	4.508	4.768	5.042	5.329	5.629	5.945	6.275
8	4.595	4.908	5.239	5.590	5.960	6.353	6.767	7.206	7.669	8.157
9	5.560	5.987	6.444	6.931	7.451	8.004	8.595	9.223	9.893	10.604
10	6.727	7.305	7.926	8.549	9.313	10.086	10.915	11.806	12.761	13.786
11	8.140	8.912	9.749	10.657	11.642	12.708	13.862	15.112	16.462	17.921
12	9.850	10.872	11.991	13.215	14.552	16:012	17.605	19.343	21.236	23.298
13	11.918	13.264	14.749	16.386	18.190	20.175	22.359	24.759	27.395	30.287
14	14.421	16.182	18.141	20.319	22.737	25.420	28.395	31.961	35.339	39.373
15	17.449	19.742	22.314	25.196	28.422	32.030	36.062	40.565	45.587	51.185
16	21.113	24.084	27.446	31.243	35.527	40.357	45.799	51.923	58.808	66.541
17	25.547	29.384	33.758	38.741	44.409	50.850	58.165	66.461	75.862	86.503
18	30.912	35.848	41.523	48.039	55.511	64.071	73.869	85.071	97.862	112.454
19	37.404	43.735	51.073	59.568	69.389	80.730	93.813	108.890	126.242	146.190
20	45.258	53.357	62.820	73.864	86.736	101.720	119.143	139.380	162.852	190.047
25	117.388	144.207	176.857	216.542	264.698	323.040	393.628	478.905	581.756	705.627
30	304.471	389.748	497.904	634.820	807.793	1025.904	1300.477	1645.504	2078.208	2619.937

Table A2: *Factors for Compounded Value of an Annuity i.e., $CVAF_{(r\%, n)}$*

Period n	*1%*	*2%*	*3%*	*4%*	*5%*	*6%*	*7%*	*8%*	*9%*	*10%*
1	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2	2.010	2.020	2.030	2.040	2.050	2.060	2.070	2.080	2.090	2.100
3	3.030	3.060	3.091	3.122	3.152	3.184	3.215	3.246	3.278	3.310
4	4.060	4.122	4.184	4.246	4.310	4.375	4.440	4.506	4.573	4.641
5	5.101	5.204	5.309	5.416	5.526	5.637	5.751	5.867	5.985	6.105
6	6.152	6.308	6.468	6.633	6.802	6.975	7.153	7.336	7.523	7.716
7	7.214	7.434	7.662	7.898	8.142	8.394	8.654	8.923	9.200	9.487
8	8.286	8.583	8.892	9.214	9.549	9.897	10.260	10.637	11.028	11.436
9	9.369	9.755	10.159	10.583	11.027	11.491	11.978	12.448	13.021	13.579
10	10.462	10.950	11.464	12.006	12.578	13.181	13.816	14.487	15.193	15.937
11	11.567	12.169	12.808	13.486	14.207	14.972	15.784	16.645	17.560	18.531
12	12.683	13.412	14.192	15.026	15.917	16.870	17.888	18.977	20.141	21.384
13	13.809	14.680	15.618	16.627	17.713	18.882	20.141	21.495	22.953	24.523
14	14.947	15.974	17.086	18.292	19.599	21.015	22.550	24.215	26.019	27.975
15	16.097	17.293	18.599	20.024	21.579	23.276	25.129	27.152	29.361	31.772
16	17.258	18.639	20.157	21.825	23.657	25.673	27.888	30.324	33.003	35.950
17	18.430	20.012	21.762	23.698	25.840	28.213	30.840	33.750	36.974	40.545
18	19.615	21.412	23.414	25.645	28.132	30.906	33.999	37.450	41.301	45.599
19	20.811	22.841	25.117	27.671	30.539	33.760	37.379	41.446	46.018	51.159
20	22.019	24.297	26.870	29.778	33.066	36.786	40.995	45.762	51.160	57.275
25	28.243	32.030	36.459	41.646	47.727	54.865	63.249	73.106	84.701	98.347
30	34.785	40.568	47.575	56.805	66.439	79.058	94.461	113.283	136.308	164.494

Table A2: *Factors for Compounded Value of an Annuity i.e., $CVAF_{(r\%, n)}$*

Period n	*11%*	*12%*	*13%*	*14%*	*15%*	*16%*	*17%*	*18%*	*19%*	*20%*
1	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2	2.110	2.120	2.130	2.140	2.150	2.160	2.170	2.180	2.190	2.200
3	3.342	3.374	3.407	3.440	3.473	3.506	3.539	3.572	3.606	3.640
4	4.710	4.779	4.850	4.921	4.993	5.066	5.141	5.215	5.291	5.368
5	6.228	6.353	6.480	6.610	6.742	6.877	7.014	7.154	7.297	7.442
6	7.913	8.115	8.323	8.536	8.754	8.977	9.207	9.442	9.683	9.930
7	9.783	10.089	10.405	10.730	11.067	11.414	11.772	12.142	12.523	12.916
8	11.589	12.300	12.757	13.233	13.727	14.240	14.773	15.327	15.902	16.499
9	14.164	14.776	15.416	16.085	16.786	17.518	18.285	19.086	19.923	20.799
10	16.722	17.549	18.420	19.337	20.304	21.321	22.393	23.521	24.709	25.959
11	19.561	20.655	21.814	23.004	24.349	25.733	27.200	28.755	30.404	32.150
12	22.713	24.133	25.650	27.271	29.002	30.850	32.824	34.931	37.180	39.580
13	26.212	28.029	29.985	32.089	34.352	36.786	39.404	42.219	45.244	48.497
14	30.095	32.393	34.883	37.581	40.505	43.672	47.103	50.818	54.841	59.196
15	34.405	37.280	40.417	43.842	47.580	51.660	56.110	60.965	66.261	72.035
16	39.190	42.753	46.672	50.980	55.717	60.925	66.649	72.939	79.850	87.442
17	44.501	48.884	53.739	59.118	65.075	71.673	78.979	87.068	96.022	105.931
18	50.396	55.750	61.725	68.394	75.836	84.141	93.406	103.740	115.266	128.117
19	56.939	63.440	70.749	78.969	88.212	98.603	110.285	123.414	138.166	154.740
20	64.203	72.052	80.947	91.025	102.44	115.380	130.033	146.628	165.418	186.688
25	114.413	133.334	155.620	181.871	212.793	249.214	292.105	342.603	402.042	471.981
30	199.021	241.333	293.199	356.787	434.745	530.321	647.439	790.748	966.712	1181.882

Table A2: *Factors for Compounded Value of an Annuity i.e., $CVAF_{(r\%, n)}$*

Period n	*21%*	*22%*	*23%*	*24%*	*25%*	*26%*	*27%*	*28%*	*29%*	*30%*
1	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2	2.210	2.220	2.230	2.240	2.250	2.260	2.270	2.280	2.290	2.300
3	3.674	3.708	3.743	3.778	3.813	3.843	3.883	3.918	3.954	3.990
4	5.446	5.524	5.604	5.684	5.766	5.848	5.931	6.016	6.101	6.187
5	7.589	7.740	7.893	8.048	8.207	8.368	8.533	8.700	8.870	9.043
6	10.183	10.442	10.708	10.980	11.259	11.544	11.837	12.136	12.442	12.756
7	13.321	13.740	14.171	14.615	15.073	15.546	16.032	16.534	17.051	17.583
8	17.119	17.762	18.430	19.123	19.842	20.588	21.361	22.163	22.995	23.858
9	21.714	22.670	23.669	24.712	25.802	26.940	28.129	29.369	30.664	32.015
10	27.274	28.657	30.113	31.643	33.253	34.945	36.723	38.592	40.556	42.619
11	34.001	35.962	38.039	40.238	42.566	45.030	47.639	50.399	53.318	56.405
12	42.141	44.873	47.787	50.985	54.208	57.738	61.501	65.510	69.780	74.326
13	51.991	55.745	59.778	64.110	68.760	73.750	79.106	84.853	91.016	97.624
14	63.909	69.009	74.528	80.496	86.949	93.925	101.465	109.612	118.411	127.912
15	78.330	85.191	92.669	100.815	109.687	119.346	129.860	141.303	153.750	167.285
16	95.779	104.933	114.983	126.011	138.109	151.375	165.922	181.868	199.337	218.470
17	116.892	129.019	142.428	157.253	173.636	191.733	211.721	233.791	258.145	285.011
18	142.439	158.403	176.187	195.994	218.045	242.583	269.885	300.252	334.006	371.514
19	173.351	194.251	217.710	244.033	273.556	306.654	343.754	385.323	431.868	483.968
20	210.755	237.986	268.783	303.601	342.945	387.384	437.568	494.213	558.110	630.157
25	554.230	650.944	764.596	898.092	1054.791	1238.617	1454.180	1706.803	2002.608	2348.765
30	1445.111	1767.044	2160.459	2640.916	3227.172	3941.953	4812.891	5873.231	7162.785	8729.805

Table A3 : *Factors for Present Value of a Future Amount i.e., PVF* $_{(r\%,n)}$

Period n	*1%*	*2%*	*3%*	*4%*	*5%*	*6%*	*7%*	*8%*	*9%*	*10%*
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909
2	0.980	0.961	0.943	0.925	0.907	0.890	0.873	0.857	0.842	0.826
3	0.971	0.942	0.915	0.889	0.864	0.840	0.816	0.794	0.772	0.751
4	0.961	0.924	0.889	0.855	0.823	0.792	0.763	0.735	0.708	0.683
5	0.951	0.906	0.863	0.822	0.784	0.747	0.713	0.681	0.650	0.621
6	0.942	0.888	0.838	0.790	0.746	0.705	0.666	0.630	0.596	0.564
7	0.933	0.871	0.813	0.760	0.711	0.665	0.623	0.583	0.547	0.513
8	0.923	0.853	0.789	0.731	0.677	0.627	0.582	0.540	0.502	0.467
9	0.914	0.837	0.766	0.703	0.645	0.592	0.544	0.500	0.460	0.424
10	0.905	0.820	0.744	0.676	0.614	0.558	0.508	0.463	0.422	0.386
11	0.896	0.804	0.722	0.650	0.585	0.527	0.475	0.429	0.388	0.350
12	0.887	0.788	0.701	0.625	0.557	0.497	0.444	0.397	0.356	0.319
13	0.879	0.773	0.681	0.601	0.530	0.469	0.415	0.368	0.326	0.290
14	0.870	0.758	0.661	0.577	0.505	0.442	0.388	0.340	0.299	0.263
15	0.861	0.743	0.642	0.555	0.481	0.417	0.362	0.315	0.275	0.239
16	0.853	0.728	0.623	0.534	0.458	0.394	0.339	0.292	0.252	0.218
17	0.844	0.714	0.605	0.513	0.436	0.371	0.317	0.270	0.231	0.198
18	0.836	0.700	0.587	0.494	0.416	0.350	0.296	0.250	0.212	0.180
19	0.828	0.686	0.570	0.475	0.396	0.331	0.276	0.232	0.194	0.164
20	0.820	0.673	0.554	0.456	0.377	0.312	0.258	0.215	0.178	0.149
25	0.780	0.610	0.478	0.375	0.295	0.233	0.184	0.146	0.116	0.092
30	0.742	0.552	0.412	0.308	0.231	0.174	0.131	0.099	0.075	0.057

Table A3 : *Factors for Present Value of a Future Amount i.e., PVF* $_{(r\%,n)}$

Period n	*11%*	*12%*	*13%*	*14%*	*15%*	*16%*	*17%*	*18%*	*19%*	*20%*
1	0.901	0.893	0.885	0.877	0.870	0.862	0.855	0.847	0.840	0.833
2	0.812	0.797	0.783	0.769	0.756	0.743	0.731	0.718	0.706	0.694
3	0.731	0.712	0.693	0.675	0.658	0.641	0.624	0.609	0.593	0.579
4	0.659	0.636	0.613	0.592	0.572	0.552	0.534	0.516	0.499	0.482
5	0.593	0.567	0.543	0.519	0.497	0.476	0.456	0.437	0.419	0.402
6	0.535	0.507	0.480	0.456	0.432	0.410	0.390	0.370	0.352	0.335
7	0.482	0.452	0.425	0.400	0.376	0.354	0.333	0.314	0.296	0.279
8	0.434	0.404	0.376	0.351	0.327	0.305	0.285	0.266	0.249	0.233
9	0.391	0.361	0.333	0.308	0.284	0.263	0.243	0.226	0.209	0.194
10	0.352	0.322	0.295	0.270	0.247	0.227	0.208	0.191	0.176	0.162
11	0.317	0.287	0.261	0.237	0.215	0.195	0.178	0.162	0.148	0.135
12	0.286	0.257	0.231	0.208	0.187	0.168	0.152	0.137	0.124	0.112
13	0.258	0.229	0.204	0.182	0.163	0.145	0.130	0.116	0.104	0.093
14	0.232	0.205	0.181	0.160	0.141	0.125	0.111	0.099	0.088	0.078
15	0.209	0.183	0.160	0.140	0.123	0.108	0.095	0.084	0.074	0.065
16	0.188	0.163	0.141	0.123	0.107	0.093	0.081	0.071	0.062	0.054
17	0.170	0.146	0.125	0.108	0.093	0.080	0.069	0.060	0.052	0.045
18	0.153	0.130	0.111	0.095	0.081	0.069	0.059	0.051	0.044	0.038
19	0.138	0.116	0.098	0.083	0.070	0.060	0.051	0.043	0.037	0.031
20	0.124	0.104	0.087	0.073	0.061	0.051	0.043	0.037	0.031	0.026
25	0.074	0.059	0.047	0.038	0.030	0.024	0.020	0.016	0.013	0.010
30	0.044	0.033	0.026	0.020	0.015	0.012	0.009	0.007	0.005	0.004

Table A3 : *Factors for Present Value of a Future Amount i.e., PVF* $_{(r\%,n)}$

Period n	*21%*	*22%*	*23%*	*24%*	*25%*	*26%*	*27%*	*28%*	*29%*	*30%*
1	0.826	0.820	0.813	0.806	0.800	0.794	0.787	0.781	0.775	0.769
2	0.683	0.672	0.661	0.650	0.640	0.630	0.620	0.610	0.601	0.592
3	0.564	0.551	0.537	0.524	0.512	0.500	0.488	0.477	0.466	0.455
4	0.466	0.451	0.437	0.423	0.410	0.397	0.384	0.373	0.361	0.350
5	0.386	0.370	0.355	0.341	0.328	0.315	0.303	0.291	0.280	0.269
6	0.319	0.303	0.289	0.275	0.262	0.250	0.238	0.227	0.217	0.207
7	0.263	0.249	0.235	0.222	0.210	0.198	0.188	0.178	0.168	0.159
8	0.218	0.204	0.191	0.179	0.168	0.157	0.148	0.139	0.130	0.123
9	0.180	0.167	0.155	0.144	0.134	0.125	0.116	0.108	0.101	0.094
10	0.149	0.137	0.126	0.116	0.107	0.099	0.092	0.085	0.078	0.073
11	0.123	0.112	0.103	0.094	0.086	0.079	0.072	0.066	0.061	0.056
12	0.102	0.092	0.083	0.076	0.069	0.062	0.057	0.052	0.047	0.043
13	0.084	0.075	0.068	0.061	0.055	0.050	0.045	0.040	0.037	0.033
14	0.069	0.062	0.055	0.049	0.044	0.039	0.035	0.032	0.028	0.025
15	0.057	0.051	0.045	0.040	0.035	0.031	0.028	0.025	0.022	0.020
16	0.047	0.042	0.036	0.032	0.028	0.025	0.022	0.019	0.017	0.015
17	0.039	0.034	0.030	0.026	0.023	0.020	0.017	0.015	0.013	0.012
18	0.032	0.028	0.024	0.021	0.018	0.016	0.014	0.012	0.010	0.009
19	0.027	0.023	0.020	0.017	0.014	0.012	0.011	0.009	0.008	0.007
20	0.022	0.019	0.016	0.014	0.012	0.010	0.008	0.007	0.006	0.005
25	0.009	0.007	0.006	0.005	0.004	0.003	0.003	0.002	0.002	0.001
30	0.003	0.003	0.002	0.002	0.001	0.001	0.001	0.001	0.000	0.000

Table A4 : *Factors for Present Value of a Future Annuity i.e., PVAF* $_{(r\%,n)}$

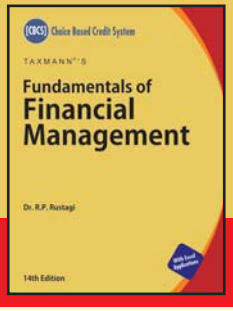
Period n	*1%*	*2%*	*3%*	*4%*	*5%*	*6%*	*7%*	*8%*	*9%*	*10%*
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909
2	1.970	1.942	1.913	1.886	1.859	1.833	1.783	1.783	1.759	1.736
3	2.941	2.884	2.829	2.775	2.723	2.673	2.624	2.577	2.531	2.487
4	3.902	3.808	3.717	3.630	3.546	3.465	3.312	3.312	3.240	3.170
5	4.853	4.713	4.580	4.452	4.329	4.212	4.100	3.993	3.890	3.791
6	5.795	5.601	5.417	5.242	5.076	4.917	4.767	4.623	4.486	4.355
7	6.728	6.472	6.230	6.002	5.789	5.582	5.389	5.206	5.033	4.868
8	7.652	7.326	7.020	6.733	6.463	6.210	5.971	5.747	5.535	5.335
9	8.566	8.162	7.786	7.435	7.108	6.802	6.515	6.247	5.995	5.759
10	9.471	8.983	8.530	8.111	7.722	7.360	7.024	6.710	6.418	6.145
11	10.368	9.787	9.253	8.760	8.306	7.887	7.499	7.139	6.805	6.495
12	11.255	10.575	9.954	9.385	8.863	8.384	7.943	7.536	7.161	6.814
13	12.134	11.348	10.635	9.986	9.394	8.858	8.358	7.904	7.487	7.103
14	13.004	12.106	11.296	10.563	9.899	9.295	8.746	8.244	7.786	7.367
15	13.865	12.849	11.938	11.118	10.380	9.712	9.108	8.560	8.061	7.606
16	14.718	13.578	12.561	11.652	10.838	10.106	9.447	8.851	8.313	7.824
17	15.562	14.292	13.166	12.166	11.274	10.477	9.763	9.122	8.544	8.002
18	16.398	14.992	13.754	12.659	11.690	10.828	10.059	9.372	8.756	8.201
19	17.226	15.679	14.324	13.134	12.085	11.158	10.336	9.604	8.950	8.365
20	18.046	16.352	14.878	13.590	12.462	11.470	10.594	9.818	9.129	8.514
25	22.023	19.524	17.413	15.622	14.094	12.783	11.654	10.675	9.823	9.077
30	25.808	22.397	19.601	17.292	15.373	13.765	12.409	11.258	10.274	9.427

Table A4 : *Factors for Present Value of a Future Annuity i.e., PVAF* $_{(r\%,n)}$

Period n	*11%*	*12%*	*13%*	*14%*	*15%*	*16%*	*17%*	*18%*	*19%*	*20%*
1	0.901	0.893	0.885	0.877	0.870	0.862	0.855	0.847	0.850	0.833
2	1.713	1.690	1.668	1.647	1.626	1.605	1.585	1.566	1.547	1.528
3	2.444	2.402	2.361	2.322	2.283	2.246	2.210	2.174	2.140	2.106
4	3.102	3.037	2.974	2.914	2.855	2.798	2.743	2.690	2.639	2.589
5	3.696	3.605	3.517	3.433	3.352	3.274	3.199	3.127	3.058	2.991
6	4.231	4.111	3.998	3.889	3.784	3.685	3.589	3.498	3.410	3.326
7	4.712	4.564	4.423	4.288	4.160	4.039	3.922	3.812	3.706	3.605
8	5.146	4.968	4.799	4.639	4.487	4.344	4.207	4.078	3.954	3.837
9	5.537	5.328	5.132	4.946	4.772	4.607	4.451	4.303	4.163	4.031
10	5.889	5.650	5.426	5.216	5.019	4.833	4.659	4.494	4.339	4.192
11	6.207	5.938	5.687	5.453	5.234	5.029	4.836	4.656	4.487	4.327
12	6.492	6.194	5.918	5.660	5.421	5.197	4.988	4.793	4.611	4.439
13	6.750	6.424	6.122	5.842	5.583	5.342	5.118	4.910	4.715	4.533
14	6.982	6.628	6.303	6.002	5.724	5.468	5.229	5.008	4.802	4.611
15	7.191	6.811	6.462	6.142	5.847	5.575	5.324	5.092	4.876	4.675
16	7.379	6.974	6.604	6.265	5.954	5.669	5.405	5.162	4.938	4.730
17	7.549	7.120	6.729	6.373	6.047	5.749	5.475	5.222	4.990	4.775
18	7.702	7.250	6.840	6.467	6.128	5.818	5.534	5.273	5.033	4.812
19	7.893	7.366	6.938	6.50	6.198	5.877	5.585	5.316	5.070	4.843
20	7.963	7.469	7.025	6.623	6.259	5.929	5.628	5.353	5.101	4.870
25	8.422	7.843	7.330	6.873	6.464	6.097	5.766	5.467	5.195	4.948
30	8.694	8.005	7.496	7.003	6.566	6.177	5.829	5.517	5.235	4.979

Table A4 : *Factors for Present Value of a Future Annuity i.e., PVAF* $_{(r\%,n)}$

Period n	*21%*	*22%*	*23%*	*24%*	*25%*	*26%*	*27%*	*28%*	*29%*	*30%*
1	0.826	0.820	0.813	0.806	0.800	0.794	0.787	0.781	0.775	0.769
2	1.509	1.492	1.474	1.457	1.440	1.424	1.407	1.392	1.376	1.361
3	2.074	2.042	2.011	1.981	1.952	1.923	1.896	1.868	1.842	1.816
4	2.540	2.494	2.448	2.404	2.362	2.320	2.280	2.241	2.203	2.166
5	2.926	2.864	2.803	2.745	2.689	2.635	2.583	2.532	2.483	2.436
6	3.245	3.167	3.092	3.020	2.951	2.885	2.821	2.759	2.700	2.643
7	3.508	3.416	3.327	3.242	3.161	3.083	3.009	2.937	2.868	2.802
8	3.726	3.619	3.518	3.421	3.329	3.241	3.156	3.076	2.999	2.925
9	3.905	3.786	3.673	3.566	3.463	3.366	3.273	3.184	3.100	3.019
10	4.054	3.923	3.799	3.682	3.570	3.465	3.364	3.269	3.178	3.092
11	4.177	4.035	3.902	3.776	3.656	3.544	3.437	3.335	3.239	3.147
12	4.278	4.127	3.985	3.851	3.725	3.606	3.493	3.387	3.286	3.190
13	4.362	4.203	4.053	3.912	3.780	3.656	3.538	3.427	3.322	3.223
14	4.432	4.265	4.108	3.962	3.824	3.695	3.573	3.459	3.351	3.249
15	4.489	4.315	4.153	4.001	3.859	3.726	3.601	3.483	3.373	3.268
16	4.536	4.357	4.189	4.033	3.887	3.751	3.623	3.503	3.390	3.283
17	4.576	4.391	4.219	4.059	3.910	3.771	3.640	3.518	3.403	3.295
18	4.608	4.419	4.243	4.080	3.928	3.786	3.654	3.529	3.413	3.311
19	4.635	4.442	4.263	4.097	3.942	3.799	3.664	3.539	3.421	3.311
20	4.657	4.460	4.279	4.110	3.954	3.808	3.673	3.546	3.427	3.316
25	4.721	4.514	4.323	4.147	3.985	3.834	3.694	3.564	3.442	3.329
30	4.746	4.534	4.339	4.160	3.995	3.842	3.701	3.569	3.447	3.332



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